# 48TM−P06
# Single Package Rooftop Gas Heating/Electric Cooling Units Limited Production Unit with Puron® (R−410a) and Microchannel Heat Exchanger (MCHX)

Carrier®
Turn to the Experts.℠

# Installation Instructions

## TABLE OF CONTENTS


SAFETY CONSIDERATIONS . . . . . . . . . . . . . . . . . . . . . . . . . 1
INSTALLATION . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 2
Step 1 - Provide Unit Support . . . . . . . . . . . . . . . . . . . . . . . . . 2
Step 2 - Field Fabricate Ductwork . . . . . . . . . . . . . . . . . . . . . . 2
Step 3 - Install External Trap for Condensate Drain . . . . . . . . 4
Step 4 - Rig and Place Unit . . . . . . . . . . . . . . . . . . . . . . . . . . 4
Step 5 - Install Flue Hood . . . . . . . . . . . . . . . . . . . . . . . . . . . 9
Step 6 - Install Gas Piping . . . . . . . . . . . . . . . . . . . . . . . . . . . 9
Step 7 - Make Electrical Connections . . . . . . . . . . . . . . . . . . 9
Step 8 - Adjust Factory-Installed Options . . . . . . . . . . . . . . . 11
Step 9 - Adjust Evaporator-Fan Speed . . . . . . . . . . . . . . . . . 24
PRE-START-UP . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 29
START-UP . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 29
UNIT START-UP CHECKLIST . . . . . . . . . . . . . . . . . . . . . . . 35


## SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform the basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves.

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies a hazard which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

## ⚠ WARNING

**FIRE, EXPLOSION HAZARD**

Failure to follow this warning could result in personal injury or death.

Disconnect gas piping from unit when leak testing at pressure greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it must be replaced before use. When pressure testing field-supplied gas piping at pressures of 0.5 psig or less, a unit connected to such piping must be isolated by closing the manual gas valve.

## ⚠ WARNING

**ELECTRICAL SHOCK HAZARD**

Failure to follow this warning could cause personal injury or death.

Before performing service or maintenance operations on unit, turn off main power switch to unit and install lockout tag. Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate.

## ⚠ WARNING

**UNIT OPERATION AND SAFETY HAZARD**

Failure to follow this warning could cause personal injury, death and/or equipment damage.

Puron (R-410a) refrigerant systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on Puron refrigerant equipment.

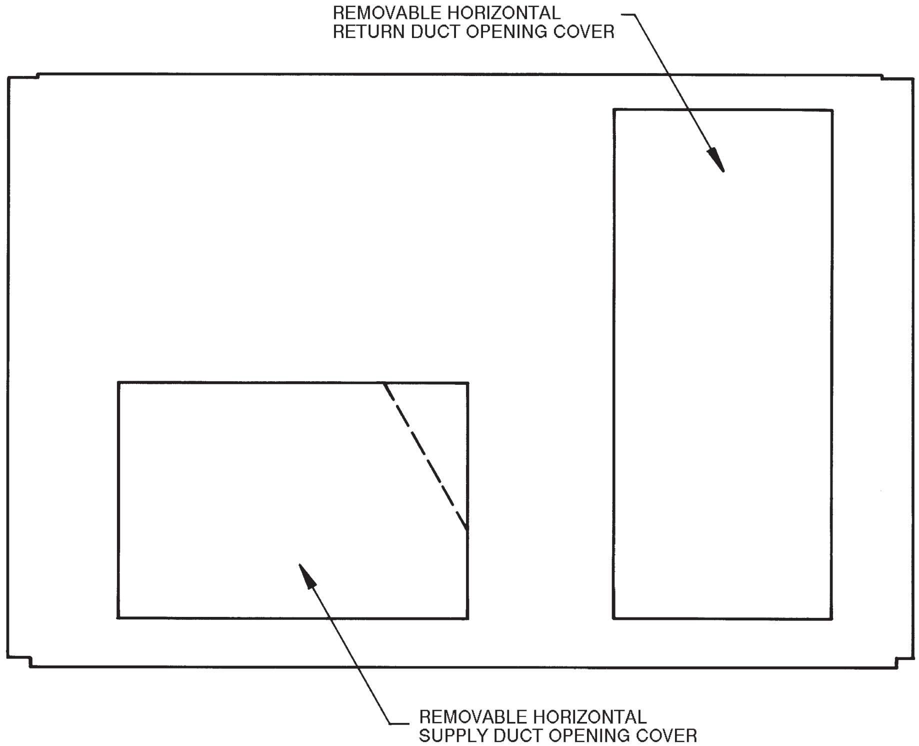



**Fig. 1 - Horizontal Conversion Panels**

# INSTALLATION

Unit is shipped in the vertical duct configuration. To convert to horizontal configuration, remove screws from side duct opening covers and remove covers. Using the same screws, install covers on vertical duct openings with the insulation-side down. Seals around duct openings must be tight. (See Fig. 1.)

Confirm before installation of unit that voltage, amperage and circuit protection requirements listed on unit data plate agree with power supply provided.

## Step 1 — Provide Unit Support

### Roof Curb

Assemble and install accessory roof curb in accordance with instructions shipped with the curb. (See Fig. 2.) Install insulation, cant strips, roofing felt, and counter flashing as shown. *Ductwork must be attached to curb and not to the unit. The accessory thru-the-bottom power and gas connection package must be installed before the unit is set on the roof curb.* If field-installed (thru-the-roof curb) gas connections are desired, use factory-supplied 3/4-in. pipe coupling and gas plate assembly to mount the thru-the-roof curb connection to the roof curb. Gas connections and power connections to the unit must be field installed after the unit is installed on the roof curb.

If electric and control wiring is to be routed through the basepan, attach the accessory thru-the-bottom service connections to the basepan in accordance with the accessory installation instructions.

**IMPORTANT**: The gasketing of the unit to the roof curb is critical for a watertight seal. Install gasket supplied with the roof curb as shown in Fig. 2. Improperly applied gasket can also result in air leaks and poor unit performance.

Curb should be level. This is necessary for unit drain to function properly. Unit leveling tolerances are show in Fig. 3. Refer to Accessory Roof Curb Installation Instructions for additional information as required.

### Slab Mount (Horizontal Units Only)

Provide a level concrete slab that extends a minimum of 6 in. beyond unit cabinet. Install a gravel apron in front of condenser coil air inlet to prevent grass and foliage from obstructing airflow.

**NOTE**: Horizontal units may be installed on a roof curb if required.

### Alternate Unit Support (Curb or Slab Mount)

A non-combustible sleeper rail can be used in the unit curb support area. If sleeper rails cannot be used, support the long sides of the unit with a minimum of 3 equally spaced 4-in. x 4-in. pads on each side.

## Step 2 — Field Fabricate Ductwork

Secure all ducts to roof curb and building structure on vertical ducted units. *Do not connect ductwork to unit.* For horizontal applications, field-supplied flanges should be attached to horizontal duct openings and all ductwork should be secured to the flanges. Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

Ducts passing through unconditioned spaces must be insulated and covered with a vapor barrier.

If a plenum return is used on a vertical unit, the return should be ducted through the roof deck to comply with applicable fire codes.

A minimum clearance is not required around ductwork. Cabinet return-air static pressure (a negative condition) shall not exceed 0.35 in. wg with economizer or 0.45 in. wg without economizer.

These units are designed for a minimum continuous heating return-air temperature of 50°F (dry bulb), or an intermittent operation down to 45°F (dry bulb), such as when used with a night set-back thermostat. To operate at lower return-air temperatures, a field-supplied outdoor air temperature control must be used to initiate both stages of heat when the temperature is below 45°F. Indoor comfort may be compromised when these lower air temperatures are used with insufficient heating temperature rise.

| CONNECTOR PKG. ACC. | B | C | D ALT DRAIN HOLE | GAS | POWER | CONTROL | ACCESSORY PWR |
|---|---|---|---|---|---|---|---|
| CRBTMPWR001A01 | 1′-9 11/16″ | 1′-4″ | 1 3/4″ | 3/4″ NPT | 3/4″ NPT 1 1/4″ | 1/2″ NPT | 1/2″ NPT |
| CRBTMPWR003A01 | ↓ | ↓ | ↓ | 1/2″ NPT | 3/4″ NPT | ↓ | ↓ |

| ROOFCURB ACCESSORY | A | UNIT SIZE |
|---|---|---|
| CRRFCURB001A01 | 1′-2″ [356] | 48TM-P06 |
| CRRFCURB002A01 | 2′-0″ [610] | |

NOTES:
1. ROOFCURB ACCESSORY IS SHIPPED DISASSEMBLED.
2. INSULATED PANELS.
3. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
4. ROOFCURB: GALVANIZED STEEL.
5. ATTACH DUCTWORK TO CURB. (FLANGES OF DUCT REST ON CURB)
6. SERVICE CLEARANCE 4 FEET ON EACH SIDE.
7. ⇨ DIRECTION OF AIR FLOW.
8. CONNECTOR PACKAGES CRBTMPWR001A01 AND 2A01 ARE FOR THRU-THE-CURB TYPE GAS. PACKAGES CRBTMPWR003A01 AND 4A01 ARE FOR THE THRU-THE-BOTTOM TYPE GAS CONNECTIONS.

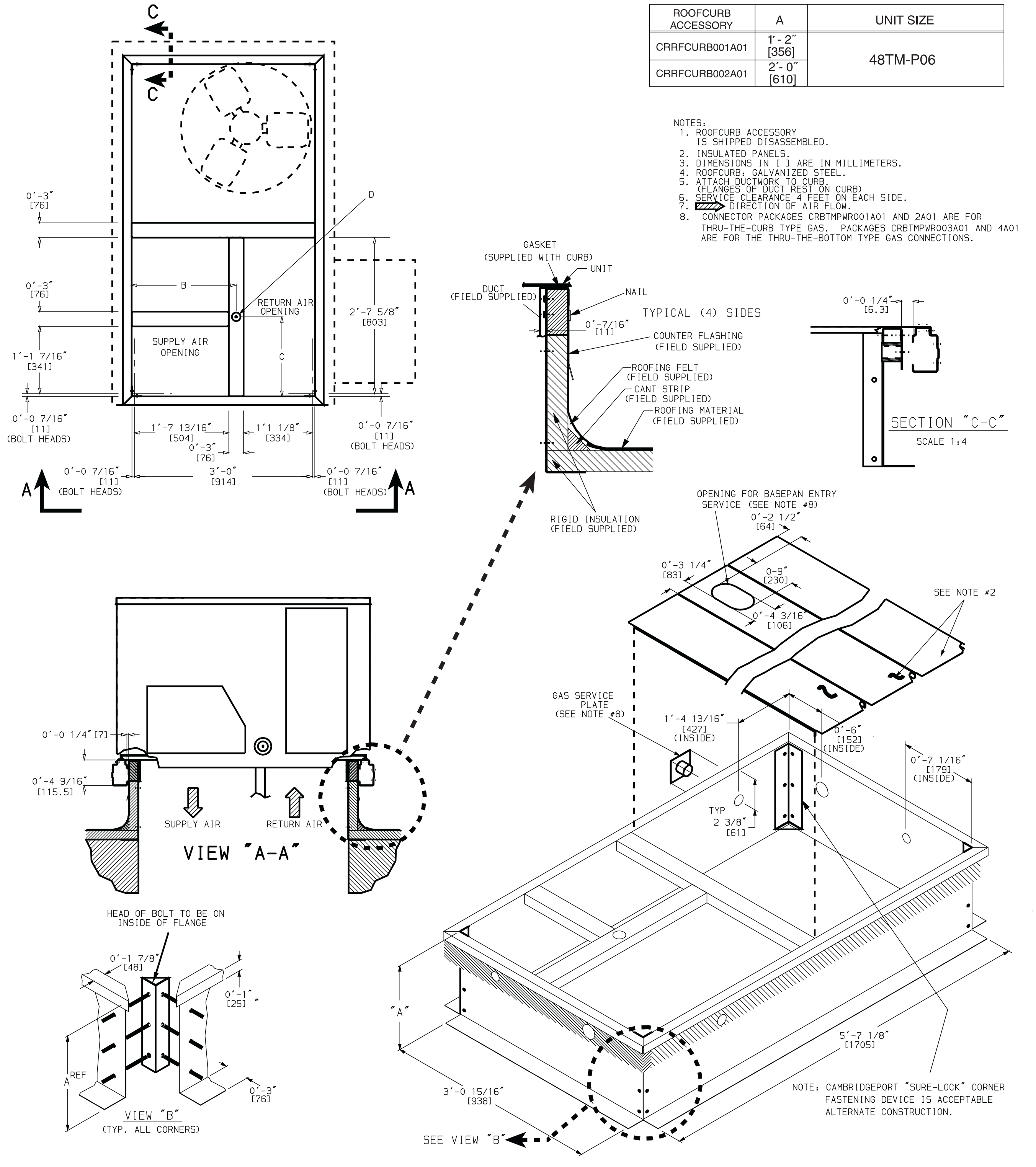



**Fig. 2 - Roof Curb Details**

48TM–P06

## Step 3 — Install External Trap for Condensate Drain

The unit has one $^3/_4$-in. condensate drain connection on the bottom and another on the side of the unit. Unit discharge connections do not determine the use of drain connections. Either drain connection can be used with vertical or horizontal applications.

When using the standard side drain connection, make sure the red plug in the alternate bottom connection is tight before installing the unit.

To use the bottom drain connection for a roof curb installation, relocate the factory-installed red plug from the bottom connection to the side connection. The center drain plug looks like a square connection, however it can be removed with a 1/2–in. socket drive extension. (See Fig. 4.) The piping for the condensate drain and external trap can be completed after the unit is in place. (See Fig. 5.)

*All units must have an external trap for condensate drainage. Install a trap at least 4-in. deep and protect against freeze-up. If drain line is installed downstream from the external trap, pitch the line away from the unit at 1-in. per 10 ft of run. Do not use a pipe size smaller than the unit connection ($^3/_4$-in.).*

## Step 4 — Rig and Place Unit

Inspect unit for transportation damage. File any claim with transportation agency. Keep unit upright and do not drop. Spreader bars are not required if top crating is left on unit. Rollers may be used to move unit across a roof. Level by using unit frame as a reference. See Table 1 and Fig. 6 for additional information.

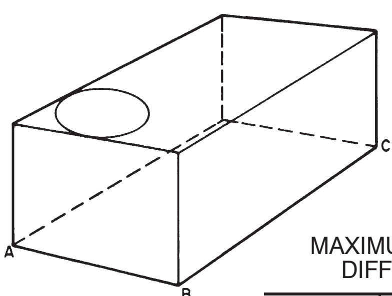
Lifting holes are provided in base rails as shown in Fig. 7. Refer to rigging instructions on unit.

**⚠ CAU-**

**UNIT DAMAGE HAZARD**

Failure to follow this caution may result in equipment damage.

All panels must be in place when rigging. Unit is not designed for handling by fork truck.




MAXIMUM ALLOWABLE DIFFERENCE (in.)

| A-B | B-C | A-C |
|---|---|---|
| 0.5 | 1.0 | 1.0 |

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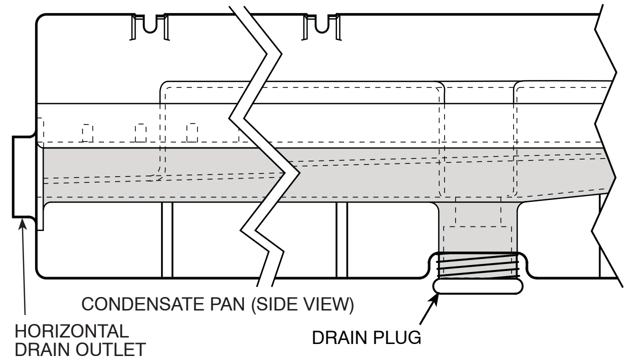
**Fig. 3 - Unit Leveling Tolerances**




NOTE: Drain plug is shown in factory-installed position.

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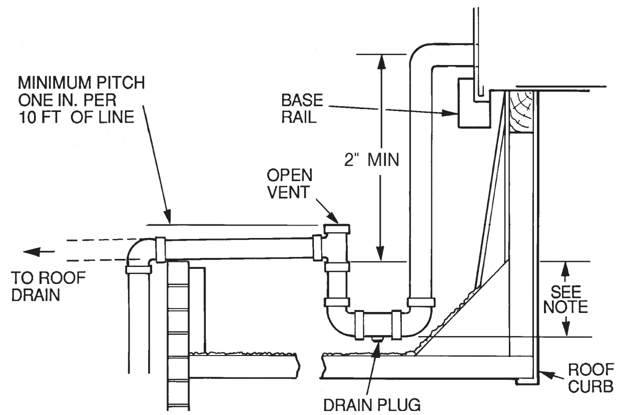
**Fig. 4 - Condensate Drain Pan (Side View)**




NOTE: Trap should be deep enough to offset maximum unit static difference. A 4-in. trap is recommended.

C06235

**Fig. 5 - Condensate Drain Piping Details**

**Positioning**

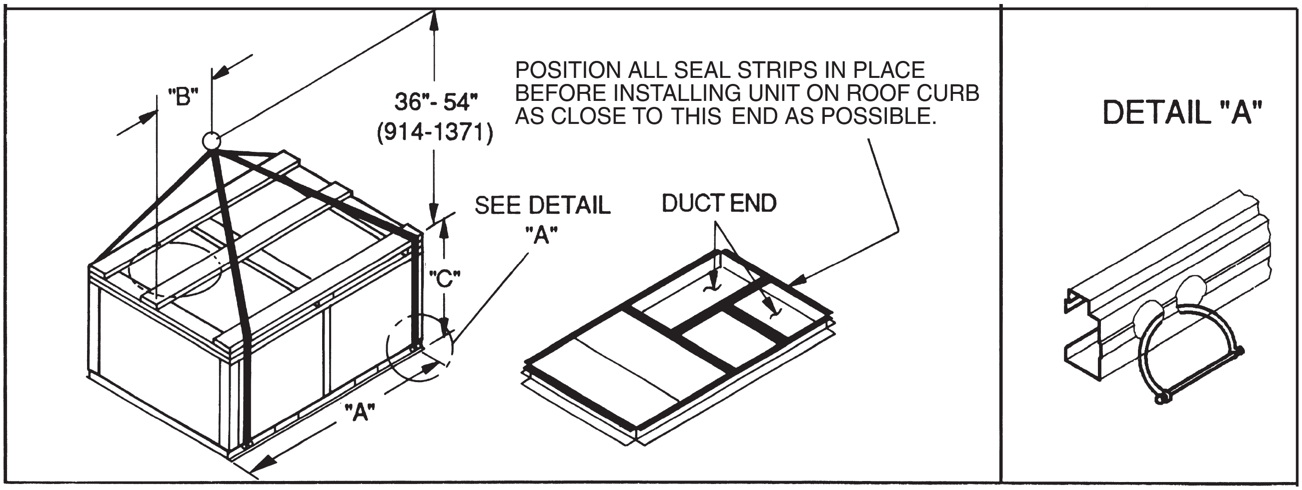
Maintain clearance around and above unit to provide minimum distance from combustible materials, proper airflow and service access. (See Fig. 7.) A properly positioned unit will have the following clearances between unit and roof curb: 1/4–in. clearance between roof curb and base rails on each side and duct end of unit; 1/4–in. clearance between roof curb and condenser coil end of unit. (See Fig. 2, section C–C.)

Do not install unit in an indoor location. Do not locate unit air inlets near exhaust vents or other sources of contaminated air.

Be sure that unit is installed such that snow will not block the combustion intake or flue outlet.

Unit may be installed directly on wood flooring or on Class A, B, or C roof–covering material when roof curb is used.

Although unit is weatherproof, guard against water from higher level runoff and overhangs.






C06005

NOTES:
1. Dimensions in ( ) are in millimeters.
2. Hook rigging shackles through holes in base rail, as shown in detail "A." Holes in base rails are centered around the unit center of gravity. Use wooden top skid when rigging to prevent rigging straps from damaging unit.
3. Unit weights do not include economizer.

| UNIT SIZE | MAX WEIGHT | | DIMENSIONS | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | "A" | | "B" | | "C" | |
| | lb | kg | in. | mm | in. | mm | in. | mm |
| 48TM–P06 | 610 | 277 | 73.69 | 1872 | 35.69 | 906 | 33.35 | 845 |

**Fig. 6 - Rigging Details**

**⚠ CAUTION**

**UNIT DAMAGE HAZARD**

Failure to follow this caution may result in equipment damage.

All panels must be in place when rigging. Unit is not designed for handling by fork truck.

*Flue vent discharge must have a minimum horizontal clearance of 4 ft from electric and gas meters, gas regulators, and gas relief equipment. Minimum distance between unit and other electrically live parts is 48 inches.*

Flue gas can deteriorate building materials. Orient unit such that flue gas will not affect building materials. Locate mechanical draft system flue assembly at least 48 in. from an adjacent building or combustible material.

After unit is in position, remove rigging skids and shipping materials.

Adequate combustion-air and ventilation-air space must be provided for proper operation of this equipment. Be sure that installation complies with all local codes and Section 5.3, Air for Combustion and Ventilation, NFGC (National Fuel Gas Code), and ANSI (American National Standards Institute) Z223.1, and NFPA (National Fire Protection Association) 54 TIA-54-84-1. In Canada, installation must be in accordance with the CAN1-B149 installation codes for gas burning appliances.

| UNIT | STD. UNIT WEIGHT LBS. | STD. UNIT WEIGHT KG. | ECONOMI$ER IV WEIGHT LBS. | ECONOMI$ER IV WEIGHT KG. | VERT. ECON IV W/P.E. WEIGHT LBS. | VERT. ECON IV W/P.E. WEIGHT KG. | (A) CORNER WEIGHT LBS. | (A) CORNER WEIGHT KG. | (B) CORNER WEIGHT LBS. | (B) CORNER WEIGHT KG. | (C) CORNER WEIGHT LBS. | (C) CORNER WEIGHT KG. | (D) CORNER WEIGHT LBS. | (D) CORNER WEIGHT KG. | "J" FT.-IN. | "J" MM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 48TM-P06 | 560 | 254 | 50 | 22.7 | 90 | 40.9 | 134 | 60.8 | 129 | 58.5 | 146 | 66.2 | 151 | 68.5 | 2'-9 5/16" | 846.5 |

BOTTOM POWER CHART: THESE HOLES REQ'D FOR USE WITH ACCESSORY PACKAGES - CRBTMPWR001A01,3A01

| THREADED CONDUIT SIZE | WIRE USE | REQ'D HOLE SIZES (MAX.) |
|---|---|---|
| 1/2" | ACC. | 7/8" [22.2] |
| 1/2" | 24V | 7/8" [22.2] |
| 3/4" (001,003) | POWER* | 1 1/8" [28.4] |
| 1 1/4" (002,004) | POWER* | 1 3/4" [44.4] |
| (003) 1/2" FPT | GAS | 1 1/4" [31.8] |
| (004) 3/4" FPT | GAS | 1 5/8" [41.3] |

* - SELECT EITHER 3/4" OR 1 1/4" FOR POWER, DEPENDING ON WIRE SIZE.

| | CONNECTION SIZES |
|---|---|
| A | 1 3/8" DIA. [35] FIELD POWER SUPPLY HOLE |
| B | 2" DIA. [51] POWER SUPPLY KNOCK-OUT |
| C | 1 3/4" DIA. [44] CHARGING PORT HOLE |
| D | 7/8" DIA. [22] FIELD CONTROL WIRING HOLE |
| E | 3/4"-14 NPT CONDENSATE DRAIN |
| F | 1/2"-14 NPT GAS CONNECTION |
| G | 2 1/2" DIA. [64] POWER SUPPLY KNOCK-OUT |

NOTES:

1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. (symbol) CENTER OF GRAVITY.
3. (arrow) DIRECTION OF AIR FLOW.
4. ON VERTICAL DISCHARGE UNITS, DUCTWORK TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. FOR HORIZONTAL DISCHARGE UNITS FIELD SUPPLIED FLANGES SHOULD BE ATTACHED TO HORIZONTAL DISCHARGE OPENINGS, AND ALL DUCTWORK SHOULD BE ATTACHED TO THE FLANGES.
5. MINIMUM CLEARANCE (LOCAL CODES OR JURISDICTION MAY PREVAIL):
   a. BETWEEN UNIT, FLUE SIDE AND COMBUSTIBLE SURFACES, 36 IN., 18 IN. WHEN USING ACCESSORY FLUE DISCHARGE DEFLTR.
   b. BOTTOM OF UNIT TO COMBUSTIBLE SURFACES (WHEN NOT USING CURB) 1 INCH. BOTTOM OF BASE RAIL TO COMBUSTIBLE SURFACES (WHEN NOT USING CURB) 0 INCHES.
   c. CONDENSER COIL, FOR PROPER AIR FLOW AND COMPRESSOR RELIABILITY, 36 INCHES ON REAR SIDE, 12 INCHES THE OTHER. THE SIDE GETTING THE GREATER CLEARANCE IS OPTIONAL.
   d. OVERHEAD, 60 INCHES TO ASSURE PROPER CONDENSER FAN OPERATION.
   e. BETWEEN UNITS, CONTROL BOX SIDE, 42 IN. PER NEC.
   f. BETWEEN UNIT AND UNGROUNDED SURFACES, CONTROL BOX SIDE, 36 IN. PER NEC.
   g. BETWEEN UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, CONTROL BOX SIDE, 42 IN. PER NEC.
   h. HORIZONTAL SUPPLY AND RETURN END, 0 INCHES WHEN THE ALTERNATE CONDENSATE DRAIN IS USED.
6. WITH THE EXCEPTION OF THE CLEARANCE FOR THE CONDENSER COIL AND COMBUSTION SIDE AS STATED IN NOTE #5a, b, AND c, A REMOVABLE FENCE OR BARRICADE REQUIRES NO CLEARANCE.
7. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM WOOD OR CLASS A, B, OR C ROOF COVERING MATERIAL IF SET ON BASE RAIL.
8. THE VERTICAL CENTER OF GRAVITY IS 1'-6" [457] UP FROM FROM THE BOTTOM OF THE BASE RAIL.

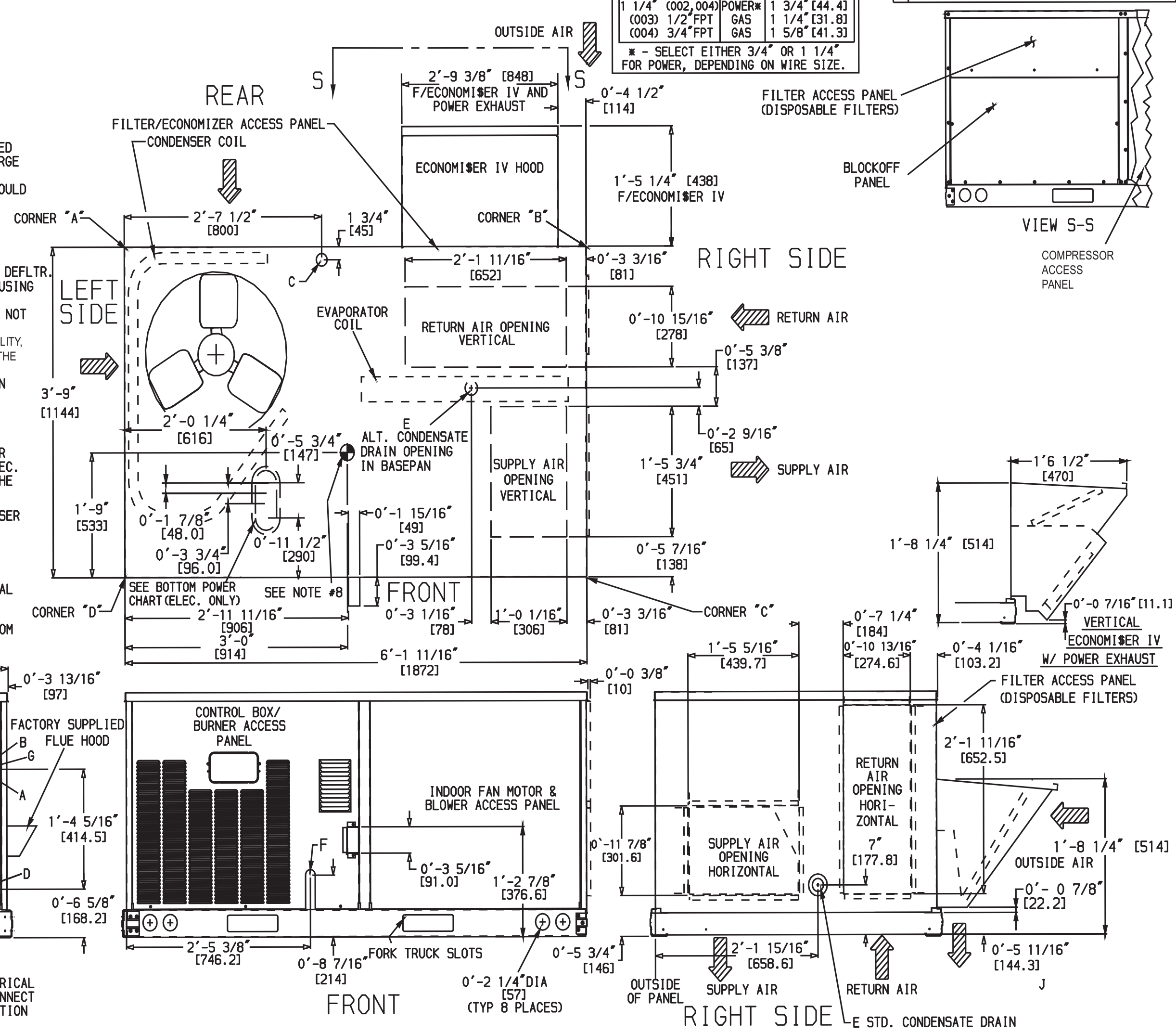



Fig. 7 - Base Unit Dimensions

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# Table 1 – Physical Data

| 48TM-P UNIT SIZE | | D/E/F/G/H/K/L/M/N06 |
|---|---|---|
| **NOMINAL CAPACITY (Tons)** | | 5 |
| **OPERATING WEIGHT (lb)** | | |
| Unit | | |
| Al/Al* | | 560 |
| EconoMi$er IV | | 50 |
| Roof Curb (14-in.) | | 115 |
| **COMPRESSOR** | | Scroll |
| Quantity | | 1 |
| Oil | | 42 |
| **REFRIGERANT TYPE** | | R-410A (Puron® Refrigerant) |
| Operating Charge (lb-oz) | | |
| Circuit 1 | | 5-13 |
| **CONDENSER COIL** | | Aluminum Tubes, Aluminum Lanced Fins, |
| Fins/in. | | 2.0 |
| Total Face Area (sq ft) | | 15.0 |
| **CONDENSER FAN** | | Propeller Type |
| Nominal Cfm | | 4,000 |
| Quantity...Diameter (in.) | | 1...22.0 |
| Motor Hp...Rpm | | 1/4...1100 |
| Watts Input (Total) | | 325 |
| **EVAPORATOR COIL** | | Enhanced Copper Tubes, Aluminum Double-Wavy Fins, Face Split |
| Expansion Device | | Acutrol™ Metering Device |
| Rows…Fins/in. | | 3…15 |
| Total Face Area (sq ft) | | 5.5 |
| **EVAPORATOR FAN** | | Centrifugal Type |
| Quantity...Size (in.) | Std | 1...10 x 10 |
| | High-Static | 1...10 x 10 |
| Type Drive | Std | Belt |
| | High-Static | Belt |
| Nominal Cfm | | 2000 |
| Maximum Continuous Bhp | Std | 2.40 |
| | High-Static | 2.90 |
| Motor Frame Size | Std | 56 |
| | HIgh-Static | 56 |
| Nominal Rpm High/Low | Std | - |
| | HIgh-Static | - |
| Fan Rpm Range | Std | 875-1192 |
| | High-Static | 1300-1685 |
| Motor Bearing Type | | Ball |
| Maximum Allowable Rpm | | 2100 |
| Motor Pulley Pitch Diameter Min/Max(in.) | Std | 2.8/3.8 |
| | High-Static | 3.4/4.4 |
| Nominal Motor Shaft Diameter (in.) | Std | 5/8 |
| | High-Static | 7/8 |
| Fan Pulley Pitch Diameter (in.) | Std | 5.5 |
| | High-Static | 4.5 |
| Belt, Quantity...Type...Length (in.) | Std | 1...A...40 |
| | High-Static | 1...A...40 |
| Pulley Center Line Distance Min. (in.) | Std | 14.7-15.5 |
| | High-Static | 14.7-15.5 |
| Speed Change per Full Turn of | Std | 65 |
| Moveable Pulley Flange (rpm) | High-Static | 75 |
| Moveable Pulley Maximum Full Turns | Std | 5 |
| From Closed Position | High-Static | 5 |
| Factory Setting (rpm) | Std | Turns Open |
| | High-Static | 3-2/3 |
| Factory Speed Setting (rpm) | Std | 1003 |
| | High-Static | 1454 |
| Fan Shaft Diameter at Pulley (in.) | | 5/8 |

LEGEND

**Al** – Aluminum

**Bhp** – Brake Horsepower

**Cu** – Copper

*Evaporator coil fin material. Contact your local Carrier representative for details about coated fins.

## Table 1 — Physical Data (cont)

| 48TM-P UNIT SIZE | | | D/E/F/G/H/K/L/M/N06 |
|---|---|---|---|
| **FURNACE SECTION** | | | |
| Rollout Switch Cutout Temp (F)† | | | 195 |
| Burner Orifice Diameter (in. ...drill size) | | | |
| Natural Gas | **Std** | **TMD/G‖** | .113...33 |
| | | **TME/H‖** | .113...33 |
| | | **TMF/K‖** | .129...30 |
| | | **TML** | .102...38 |
| | | **TMM** | .102...38 |
| | | **TMN** | .116...32 |
| Liquid Propane | **Alt** | **TMD/G‖** | .089...43 |
| | | **TME/H‖** | .089...43 |
| | | **TMF/K‖** | .104...37 |
| **Thermostat Heat Anticipator Setting (amps)** | | | |
| 208/230 v | Stage 1 | | .14 |
| | Stage 2 | | .14 |
| 460 v | Stage 1 | | .14 |
| | Stage 2 | | .14 |
| **Gas Input (Btuh) Standard Units** | | **TMD** | —/74,000 |
| | (Stage 1/Stage 2) | **TME** | —/115,000 |
| | | **TMF*** ** | 120,000/150,000 |
| | No NOx Units | **TMG‖** | 72,000 |
| | | **TMH‖** | 115,000 |
| | | **TMK‖** | 150,000 |
| | Low NOx Units | **TML††** | 60,000 |
| | | **TMM††** | 90,000 |
| | | **TMN††** | 120,000 |
| **Efficiency (Steady State) (%)** | | | 80 |
| **Temperature Rise Range** | | **TMD/G‖** | 25-55 |
| | | **TME/H‖** | 35-65 |
| | | **TMF/K‖** | 50-80 |
| | | **TML** | 20-50 |
| | | **TMM** | 30-60 |
| | | **TMN** | 40-70 |
| **Manifold Pressure (in. wg)** | | | |
| Natural Gas | **Std** | | 3.5 |
| Liquid Propane | **Alt** | | 3.5 |
| **Gas Valve Quantity** | | | 1 |
| **Gas Valve Pressure Range** | | | |
| Psig | | | 0.180-0.487 |
| in. wg | | | 5.0-13.5 |
| **Field Gas Connection** | | | |
| Size (in.) | | | 1/2 |
| **HIGH-PRESSURE SWITCH (psig)** | | | |
| Standard Compressor Internal Relief (Differential) | | | 550-625 |
| Cutout | | | 630±10 |
| Reset (Auto.) | | | 505±20 |
| **LOW PRESURE SWITCH (psig)** | | | |
| Cutout | | | 27±3 |
| Reset (Auto.) | | | 44 ± 5 |
| **FREEZE-PROTECTION THERMOSTAT (F)** | | | |
| Opens | | | 30 ± 5 |
| Closes | | | 45 ± 5 |
| **OUTDOOR-AIR INLET SCREENS** | | | Cleanable. Screen size and quantity varies by option selected. |
| **RETURN-AIR FILTERS** Quantity…Size (in.) | | | Throwaway 2...16 x 25 x 2 |

LEGEND
**Al** – Aluminum
**Bhp** – Brake Horsepower
**Cu** – Copper

*Evaporator coil fin material. Contact your local Carrier representative for details about coated fins.

† Rollout switch lockout is manually reset by interrupting power to unit or resetting thermostat.

‖ Units are California compliant three–phase high heat models.

†† California SCAQMD compliant Low NOx models have combustion products that are controlled to 40 nanograms per joule or less.

Steady State Efficiency is 80% on units.

## Step 5 — Install Flue Hood

Flue hood is shipped screwed to the basepan beside the burner compartment access panel. Remove from shipping location and using screws provided, install flue hood and screen in location shown in Fig. 8.

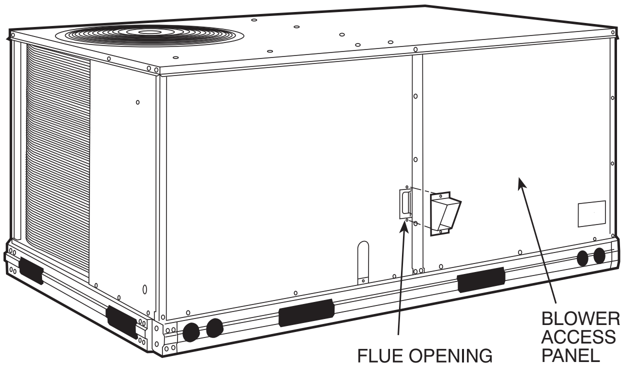



**Fig. 8 - Flue Hood Details**

## Step 6 — Install Gas Piping

Unit is equipped for use with type of gas shown on nameplate. Refer to local building codes, or in the absence of local codes, to ANSI Z223.1 entitled National Fuel Gas Code. In Canada, installation must be in accordance with the CAN1.B149.1 and CAN1.B149.2 installation codes for gas burning appliances.

*For natural gas applications, gas pressure at unit gas connection must not be less than 4 in. wg or greater than 13.0 in. wg while unit is operating.* On 48TM-P06, high heat unit, the gas pressure at unit gas connection must not be less than 5 in. wg or greater than 13 in. wg while the unit is operating. For propane applications, the gas pressure must not be less than 5 in. wg or greater than 13 in. wg at the unit connection.

*Size gas supply piping for 0.5 in. wg maximum pressure drop.* Do not use supply pipe smaller than unit gas connection. Support gas piping as shown in the table in Fig. 9. For example, a 3/4-in. gas pipe must have one field-fabricated support beam every 8 ft. Therefore, an 18-ft long gas pipe would have a minimum of 2 support beams, a 48-ft long pipe would have a minimum of 6 support beams.

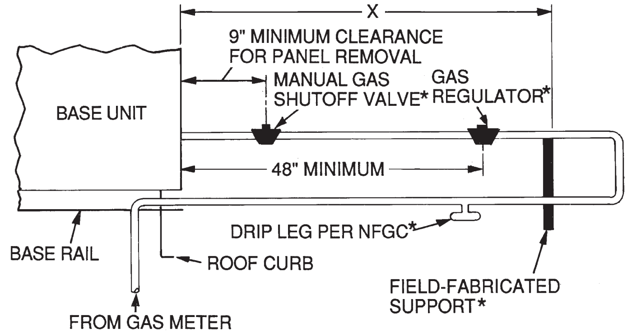
See Fig. 9 for typical pipe guide and locations of external manual main shutoff valve.

**⚠ CAU-**

**EQUIPMENT DAMAGE HAZARD**

Failure to follow this caution may result in damage to equipment.

When connecting the gas line to the unit gas valve, the installer MUST use a backup wrench to prevent damage to the valve.




LEGEND

**NFGC** — National Fuel Gas Code

*Field supplied.

NOTE: Follow all local codes.

SPACING OF SUPPORTS

| STEEL PIPE NOMINAL DIAMETER (in.) | SPACING OF SUPPORTS X DIMENSION (ft) |
|---|---|
| 1/2 | 6 |
| 3/4 or 1 | 8 |
| 1 1/4 or larger | 10 |

C06115

**Fig. 9 - Gas Piping Guide (With Accessory Thru-the-Curb Service Connections)**

## Step 7 — Make Electrical Connections

**⚠ WARNING**

**ELECTRICAL SHOCK HAZARD**

Failure to follow this warning could result in personal injury or death.

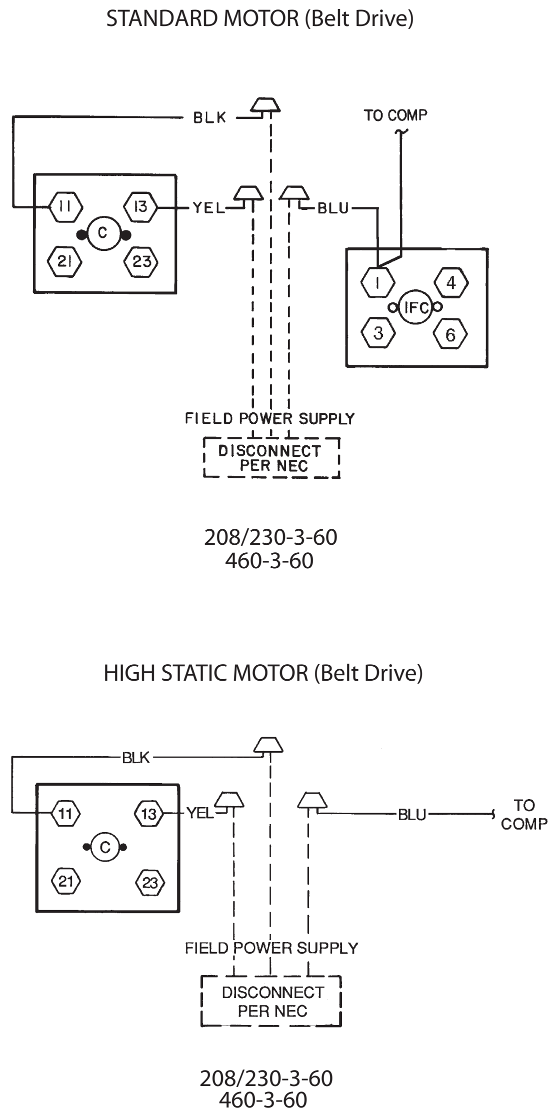
*Do not use gas piping as an electrical ground.* Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code); ANSI/NFPA (American National Standards Institute/National Fire Protection Association), latest edition (in Canada, Canadian Electrical Code CSA [Canadian Standards Association] C22.1), and local electrical codes.

### Field Power Supply

All units except 208/230-v units are factory wired for the voltage shown on the nameplate. *If the 208/230-v unit is to be connected to a 208-v power supply, the transformer must be rewired by moving the black wire with the 1/4-in. female space connector from the 230-v connection and moving it to the 200-v 1/4-in. male terminal on the primary side of the transformer.*

Refer to unit label diagram for additional information. Pigtails are provided for field wire connections. Use factory-supplied splices or UL (Underwriters' Laboratories) approved copper/aluminum connector.

When installing units, provide a disconnect per NEC.




LEGEND

**C** -- Contactor
**COMP** -- Compressor
**IFC** -- Indoor-Fan Contactor
**NEC** -- National Electrical Code
**TB** -- Terminal Block

C07082

**Fig. 10 - Power Wiring Connections**

All field wiring must comply with the NEC and local requirements.

Install field wiring as follows:

1. Install conduit through side panel openings. Install conduit between disconnect and control box.
2. Install power lines to terminal connections as shown in Fig. 10.

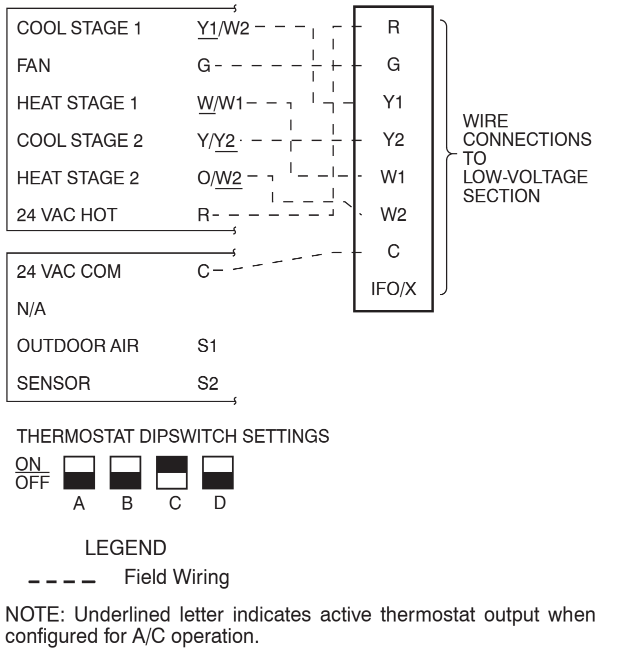
Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate. (See Table 2.) On 3-phase units, voltages between phases must be balanced within 2% and the current within 10%.Use the formula shown in the legend for Table 2, Note 2 to determine the percent of voltage imbalance. Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable Carrier warranty.

## Field Control Wiring

Install a Carrier-approved accessory thermostat assembly according to installation instructions included with the accessory. Locate thermostat assembly on a solid wall in the conditioned space to sense average temperature in accordance with thermostat installation instructions. Connect thermostat wires to terminal board.

Route thermostat cable or equivalent single leads of colored wire from subbase terminals through connector on unit to low-voltage connections on unit. (See Fig. 11.)

**NOTE**: For wire runs up to 50 ft, use no. 18 AWG (American Wire Gauge) insulated wire (35°C minimum). For 50 to 75 ft, use no. 16 AWG insulated wire (35°C minimum). For over 75 ft, use no. 14 AWG insulated wire (35°C minimum). All wire larger than no. 18 AWG cannot be directly connected to the thermostat and will require a junction box and splice at the thermostat.

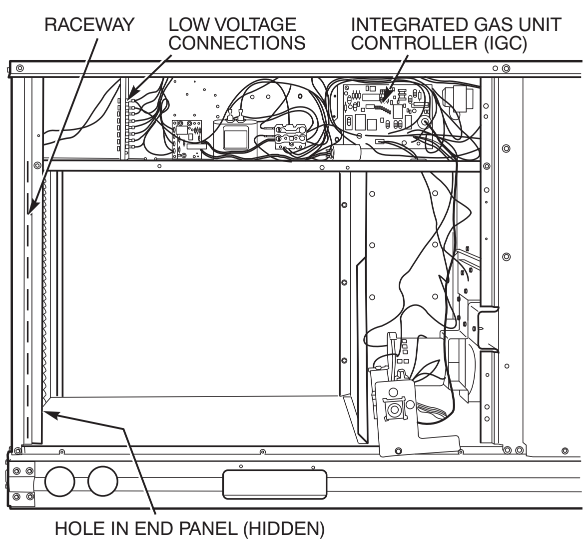



C07102

**Fig. 11 - Low-Voltage Connections**

Pass the control wires through the hole provided in the corner post; then feed wires through the raceway built into the corner post to the 24-v barrier located on the left side of the control box. (See Fig. 12.) The raceway provides the UL required clearance between high- and low-voltage wiring.

**NOTE**: If thru-the-bottom power connections are used refer to the accessory installation instructions for information on power wiring.




C07083

**Fig. 12 - Field Control Wiring Raceway**

## Heat Anticipator Settings

Set heat anticipator settings at 0.14 amp for the first stage and 0.14 amp for second-stage heating, when available.

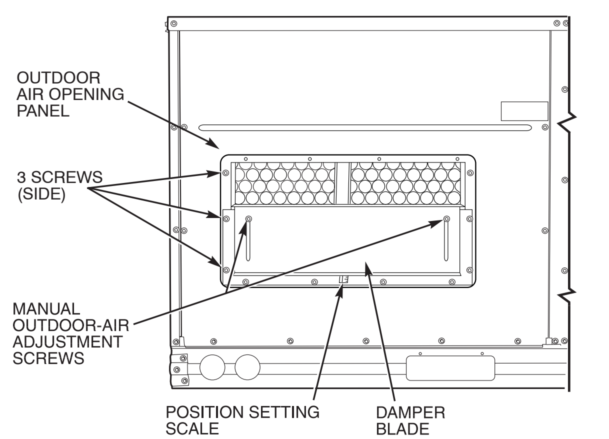
# Step 8 — Adjust Factory-Installed Options

## Manual Outdoor-Air Damper

The outdoor-air hood and screen are attached to the basepan at the bottom of the unit for shipping.

**Assembly:**

1. Determine quantity of ventilation required for building. Record amount for use in Step 8.
2. Remove and save outdoor-air opening panel and screws. (See Fig. 13.)
3. Remove evaporator coil access panel. Separate hood and screen from basepan by removing the 4 screws securing them. Save all screws.
4. Replace evaporator coil access panel.
5. Place hood on front of outdoor-air opening panel. See Fig. 13 for hood details. Secure top of hood with the 4 screws removed in Step 3. (See Fig. 15.)
6. Remove and save 6 screws (3 on each side) from sides of the manual outdoor-air damper.
7. Align screw holes on hood with screw holes on side of manual outdoor-air damper. (See Fig. 14 and 15.) Secure hood with 6 screws from Step 6.
8. Adjust minimum position setting of the damper blade by adjusting the manual outdoor-air adjustment screws on the front of the damper blade. (See Fig. 13.) Slide blade vertically until it is in the appropriate position determined by Fig. 16. Tighten screws.
9. Remove and save screws currently on sides of hood. Insert screen. Secure screen to hood using the screws. (See Fig. 15.)




C06130

**Fig. 13 - Damper Panel with Manual Outdoor-Air Damper Installed**



**Table 2 – Compressor and Motor Electrical Data**

| NOM V-Ph-Hz | COMP (ea) | | | | OFM (ea) | | | | IFM | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | TYPE | RLA | LRA | # | WATTS | HP | FLA | TYPE | MAX BHP | MAX WATTS | MAX AMP DRAW | EFF | FLA |
| 208-3-60 | 1 | Scroll | 15.6 | 110.0 | 1 | 325 | 0.25 | 1.4 | STD | 2.4 | 2120 | 5.2 | 84% | 5.2 |
| | | | | | | | | | HS | 2.9 | 2562 | 8.6 | 84% | 7.5 |
| 230-3-60 | 1 | Scroll | 15.6 | 110.0 | 1 | 325 | 0.25 | 1.4 | STD | 2.4 | 2120 | 5.2 | 84% | 5.2 |
| | | | | | | | | | HS | 2.9 | 2562 | 8.6 | 84% | 7.5 |
| 460-3-60 | 1 | Scroll | 7.8 | 52.0 | 1 | 325 | 0.25 | 0.8 | STD | 2.4 | 2120 | 2.6 | 84% | 2.6 |
| | | | | | | | | | HS | 2.9 | 2562 | 3.9 | 84% | 3.4 |

# Table 3 – Unit Electrical Data

| NOM V-Ph-Hz | IFM | ELEC. HTR | | | NO C.O. | | | | | | | | w/ PWRD C.O. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | NO P.E. | | | | w/ P.E. (pwrd from unit) | | | | NO P.E. | | | | w/ P.E. (pwrd from unit) | | | |
| | TYPE | CRHEATER ... | NOM. KW | FLA | MCA | MOCP | DISC. SIZE FLA | DISC. SIZE LRA | MCA | MOCP | DISC. SIZE FLA | DISC. SIZE LRA | MCA | MOCP | DISC. SIZE FLA | DISC. SIZE LRA | MCA | MOCP | DISC. SIZE FLA | DISC. SIZE LRA |
| 208-3-60 | STD | NONE | - | - | 26.1 | 30 | 26 | 144 | 27.8 | 30 | 29 | 146 | 30.9 | 35 | 31 | 149 | 32.6 | 35 | 34 | 151 |
| | | 002 | 4.9 | 13.6 | 26.1 | 30 | 26 | 144 | 27.8 | 30 | 29 | 146 | 30.9 | 35 | 31 | 149 | 32.6 | 35 | 34 | 151 |
| | | 004 | 7.9 | 21.9 | 33.9 | 35 | 31 | 144 | 35.6 | 40 | 34 | 146 | 39.9 | 40 | 37 | 149 | 41.6 | 45 | 40 | 151 |
| | | 005 | 12.0 | 33.4 | 48.2 | 50 | 44 | 144 | 49.9 | 50 | 47 | 146 | 54.2 | 60 | 50 | 149 | 55.9 | 60 | 53 | 151 |
| | | (2) 004* | 15.8 | 43.8 | 61.2 | 70 | 56 | 144 | 62.9 | 70 | 59 | 146 | 67.2 | 70 | 62 | 149 | 68.9 | 70 | 65 | 151 |
| | | 004, 005 | 19.9 | 55.2 | 75.6 | 80 | 70 | 144 | 77.3 | 80 | 73 | 146 | 81.6 | 90 | 75 | 149 | 83.3 | 90 | 78 | 151 |
| | HS | NONE | - | - | 28.4 | 35 | 28 | 170 | 30.1 | 35 | 31 | 172 | 33.2 | 40 | 34 | 175 | 34.9 | 40 | 37 | 177 |
| | | 002 | 4.9 | 13.6 | 28.4 | 35 | 28 | 170 | 30.1 | 35 | 31 | 172 | 33.2 | 40 | 34 | 175 | 34.9 | 40 | 37 | 177 |
| | | 004 | 7.9 | 21.9 | 36.7 | 40 | 34 | 170 | 38.4 | 40 | 37 | 172 | 42.7 | 45 | 39 | 175 | 44.4 | 45 | 42 | 177 |
| | | 005 | 12.0 | 33.4 | 51.1 | 60 | 47 | 170 | 52.8 | 60 | 50 | 172 | 57.1 | 60 | 53 | 175 | 58.8 | 60 | 56 | 177 |
| | | (2) 004* | 15.8 | 43.8 | 64.1 | 70 | 59 | 170 | 65.8 | 70 | 62 | 172 | 70.1 | 80 | 65 | 175 | 71.8 | 80 | 68 | 177 |
| | | 004, 005 | 19.9 | 55.2 | 78.4 | 80 | 72 | 170 | 80.1 | 90 | 75 | 172 | 84.4 | 90 | 78 | 175 | 86.1 | 90 | 81 | 177 |
| 230-3-60 | STD | NONE | - | - | 26.1 | 30 | 26 | 144 | 27.8 | 30 | 29 | 146 | 30.9 | 35 | 31 | 149 | 32.6 | 35 | 34 | 151 |
| | | 002 | 6.5 | 15.6 | 26.1 | 30 | 26 | 144 | 27.8 | 30 | 29 | 146 | 31.5 | 35 | 31 | 149 | 33.2 | 35 | 34 | 151 |
| | | 004 | 10.5 | 25.3 | 38.1 | 40 | 35 | 144 | 39.8 | 40 | 38 | 146 | 43.5 | 45 | 41 | 149 | 45.2 | 50 | 44 | 151 |
| | | 005 | 16.0 | 38.5 | 54.6 | 60 | 50 | 144 | 56.3 | 60 | 53 | 146 | 60.0 | 60 | 56 | 149 | 61.7 | 60 | 59 | 151 |
| | | (2) 004* | 21.0 | 50.5 | 69.6 | 70 | 64 | 144 | 71.3 | 80 | 67 | 146 | 75.7 | 80 | 70 | 149 | 77.4 | 80 | 73 | 151 |
| | | 004, 005 | 26.5 | 63.8 | 86.2 | 90 | 79 | 144 | 87.9 | 90 | 82 | 146 | 91.6 | 100 | 85 | 149 | 93.3 | 100 | 88 | 151 |
| | HS | NONE | - | - | 28.4 | 35 | 28 | 170 | 30.1 | 35 | 31 | 172 | 33.2 | 40 | 34 | 175 | 34.9 | 40 | 37 | 177 |
| | | 002 | 6.5 | 15.6 | 28.9 | 35 | 28 | 170 | 30.6 | 35 | 31 | 172 | 34.4 | 40 | 34 | 175 | 36.1 | 40 | 37 | 177 |
| | | 004 | 10.5 | 25.3 | 40.9 | 45 | 38 | 170 | 42.6 | 45 | 41 | 172 | 46.4 | 50 | 43 | 175 | 48.1 | 50 | 46 | 177 |
| | | 005 | 16.0 | 38.5 | 57.5 | 60 | 53 | 170 | 59.2 | 60 | 56 | 172 | 62.9 | 70 | 58 | 175 | 64.6 | 70 | 61 | 177 |
| | | (2) 004* | 21.0 | 50.5 | 72.5 | 80 | 67 | 170 | 74.2 | 80 | 70 | 172 | 78.5 | 80 | 72 | 175 | 80.2 | 90 | 75 | 177 |
| | | 004, 005 | 26.5 | 63.8 | 89.1 | 90 | 82 | 170 | 90.8 | 100 | 85 | 172 | 94.5 | 100 | 87 | 175 | 96.2 | 100 | 90 | 177 |
| 460-3-60 | STD | NONE | - | - | 13.2 | 20 | 13 | 69 | 14.2 | 20 | 15 | 70 | 15.3 | 20 | 15 | 71 | 16.3 | 20 | 17 | 72 |
| | | 002 | 6.0 | 7.2 | 13.2 | 20 | 13 | 69 | 14.2 | 20 | 15 | 70 | 15.3 | 20 | 15 | 71 | 16.3 | 20 | 17 | 72 |
| | | 004 | 11.5 | 13.8 | 20.5 | 25 | 19 | 69 | 21.5 | 25 | 21 | 70 | 23.3 | 25 | 21 | 71 | 24.3 | 25 | 23 | 72 |
| | | 005 | 14.0 | 16.8 | 24.3 | 25 | 22 | 69 | 25.3 | 30 | 24 | 70 | 27 | 30 | 25 | 71 | 28 | 30 | 27 | 72 |
| | | (2) 004* | 23.0 | 27.7 | 37.8 | 40 | 35 | 69 | 38.8 | 40 | 37 | 70 | 40.6 | 45 | 37 | 71 | 41.6 | 45 | 39 | 72 |
| | | 004, 005 | 25.5 | 30.7 | 41.6 | 45 | 38 | 69 | 42.6 | 45 | 40 | 70 | 44.3 | 45 | 41 | 71 | 45.3 | 50 | 43 | 72 |
| | HS | NONE | - | - | 14 | 20 | 14 | 81 | 15 | 20 | 16 | 82 | 16.1 | 20 | 16 | 84 | 17.1 | 20 | 18 | 85 |
| | | 002 | 6.0 | 7.2 | 14 | 20 | 14 | 82 | 15 | 20 | 16 | 83 | 16.1 | 20 | 16 | 84 | 17.1 | 20 | 18 | 85 |
| | | 004 | 11.5 | 13.8 | 21.5 | 25 | 20 | 82 | 22.5 | 25 | 22 | 83 | 24.3 | 25 | 22 | 84 | 25.3 | 30 | 24 | 85 |
| | | 005 | 14.0 | 16.8 | 25.3 | 30 | 23 | 82 | 26.3 | 30 | 25 | 83 | 28 | 30 | 26 | 84 | 29 | 30 | 28 | 85 |
| | | (2) 004* | 23.0 | 27.7 | 38.8 | 40 | 36 | 82 | 39.8 | 40 | 38 | 83 | 41.6 | 45 | 38 | 84 | 42.6 | 45 | 40 | 85 |
| | | 004, 005 | 25.5 | 30.7 | 42.6 | 45 | 39 | 82 | 43.6 | 45 | 41 | 83 | 45.3 | 50 | 42 | 84 | 46.3 | 50 | 42 | 85 |

LEGEND

**FLA** – Full Load Amps
**LRA** – Locked Rotor Amps
**MCA** – Minimum Circuit Amps
**MOCP** – Maximum Overcurrent Protection
**NEC** – National Electrical Code
**P.E.** – Powered Exhaust
**C.C.** – Convenience Outlet
* Heater capacity (kW) is based on heater voltage of 208 v, 230 v, 480 v, or 600 v. If power distribution voltage to unit varies from rated heater voltage, heater kW will vary accordingly.
† Fuse or HACR circuit breaker.

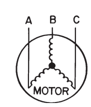
NOTES:

1. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker.
2. **Unbalanced 3-Phase Supply Voltage**

Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance.

$$\text{\% Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 460-3-60




AB = 224 v
BC = 231 v
AC = 226 v

$$\text{Average Voltage} = \frac{(224 + 231 + 226)}{3} = \frac{681}{3} = 227$$

Determine maximum deviation from average voltage.
(AB) 227 – 224 = 3 v
(BC) 231 – 227 = 4 v
(AC) 227 – 226 = 1 v
Maximum deviation is 4 v.
Determine percent of voltage imbalance.

$$\text{\% Voltage Imbalance} = 100 \times \frac{4}{227} = 1.76\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

**IMPORTANT**: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

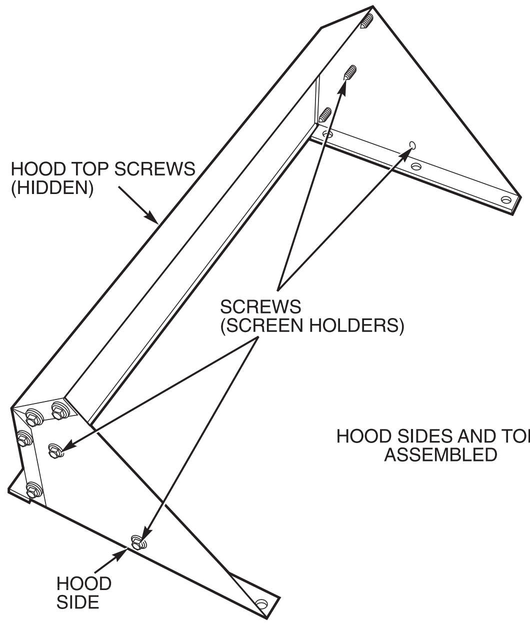



**Fig. 14 - Outdoor-Air Hood Details**

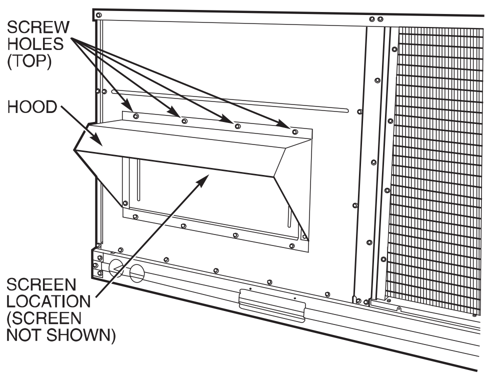



**Fig. 15 - Outdoor-Air Damper with Hood Attached**

## Convenience Outlet

An optional convenience outlet provides power for rooftop use. For maintenance personnel safety, the convenience outlet power is off when the unit disconnect is off. Adjacent unit outlets may be used for service tools. An optional "Hot Outlet" is available from the factory as a special order item.

## Novar Controls

Optional Novar controls (ETM 3051) are available for replacement or new construction jobs.

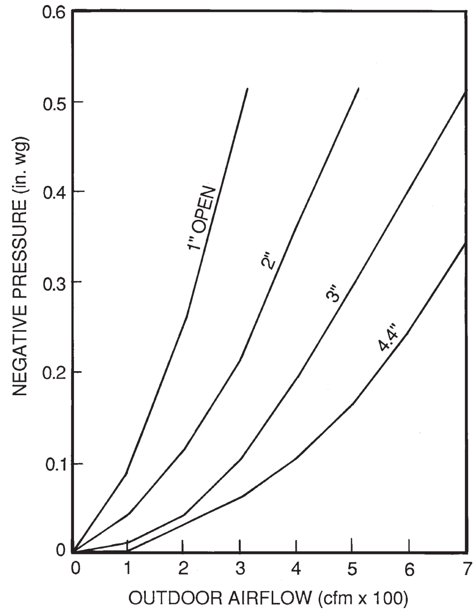


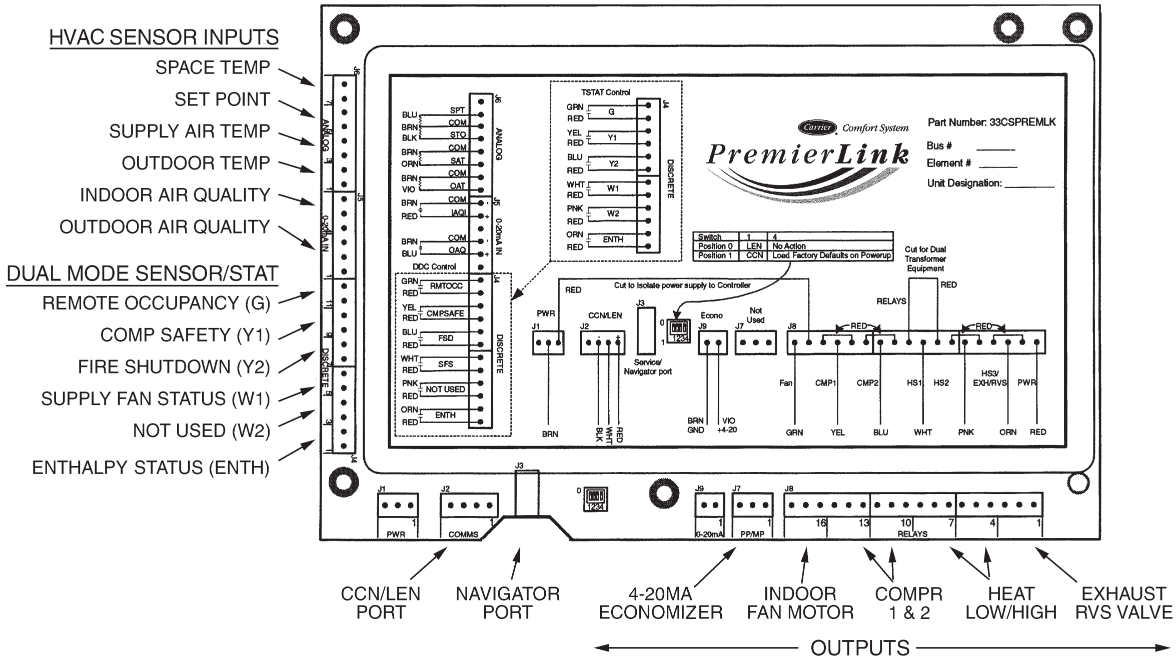

**Fig. 16 - Outdoor-Air Damper Position Setting**

## PremierLink™ Control

The PremierLink controller is compatible with Carrier Comfort Network® (CCN) devices. This control is designed to allow users the access and ability to change factory-defined settings, thus expanding the function of the standard unit control board. Carrier's diagnostic standard tier display tools such as Navigator™ or Scrolling Marquee can be used with the PremierLink controller.

The PremierLink controller (see Fig. 17 and 18) requires the use of a Carrier electronic thermostat or a CCN connection for time broadcast to initiate its internal timeclock. This is necessary for broadcast of time of day functions (occupied/unoccupied). No sensors are supplied with the field-mounted PremierLink control. The factory-installed PremierLink control includes only the supply-air temperature (SAT) sensor and the outdoor air temperature (OAT) sensor as standard. An indoor air quality ($CO_2$) sensor can be added as an option. Refer to Table 3 for sensor usage. Refer to Fig. 19 for PremierLink controller wiring. The PremierLink control may be mounted in the control panel or an area below the control panel.

**NOTE**: PremierLink controller versions 1.3 and later are shipped in Sensor mode. If used with a thermostat, the PremierLink controller must be configured to Thermostat mode.




C06016

**Fig. 17 - PremierLink™ Controller**

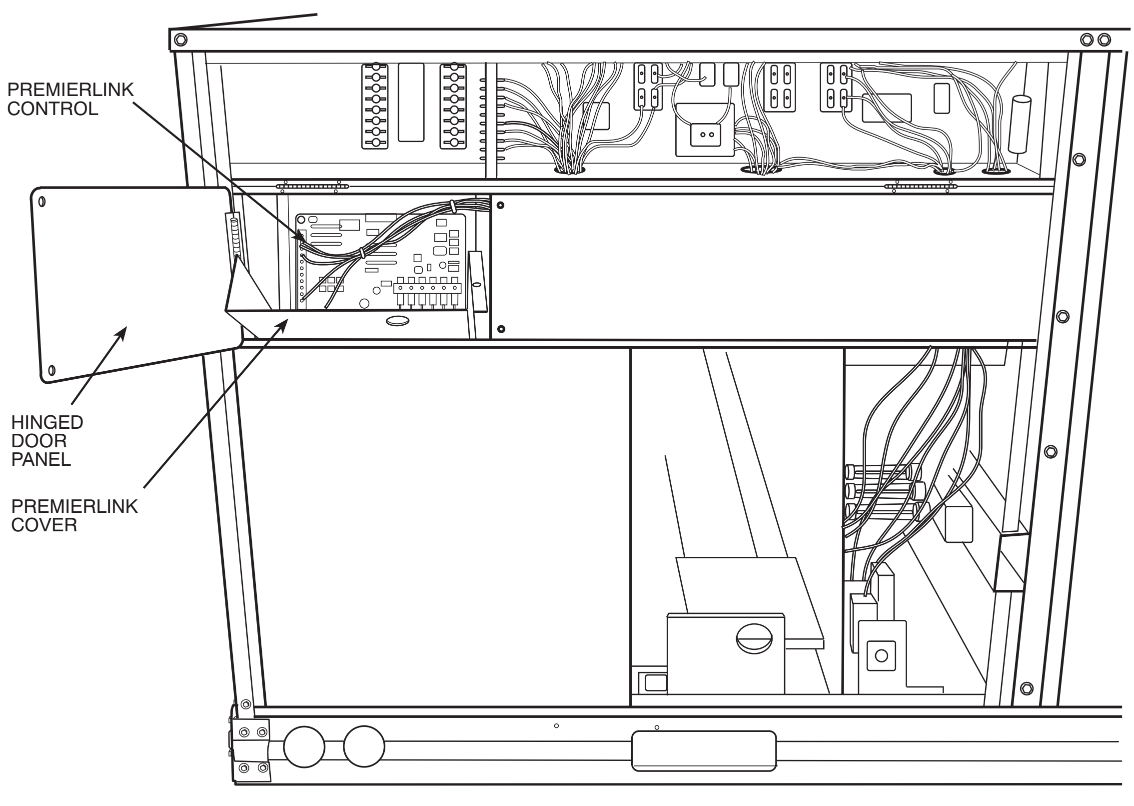



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**Fig. 18 - PremierLink Controller (Installed)**

### Install the Supply Air Temperature (SAT) Sensor

When the unit is supplied with a factory-mounted PremierLink control, the supply-air temperature (SAT) sensor (33ZCSENSAT) is factory-supplied and wired. The wiring is routed from the PremierLink control over the control box, through a grommet, into the fan section, down along the back side of the fan, and along the fan deck over to the supply-air opening.

The SAT probe is wire-tied to the supply-air opening (on the horizontal opening end) in its shipping position. Remove the sensor for installation. Re-position the sensor in the flange of the supply-air opening or in the supply air duct (as required by local codes). Drill or punch a 1/2-in. hole in the flange or duct. Use two field-supplied, self-drilling screws to secure the sensor probe in a horizontal orientation.

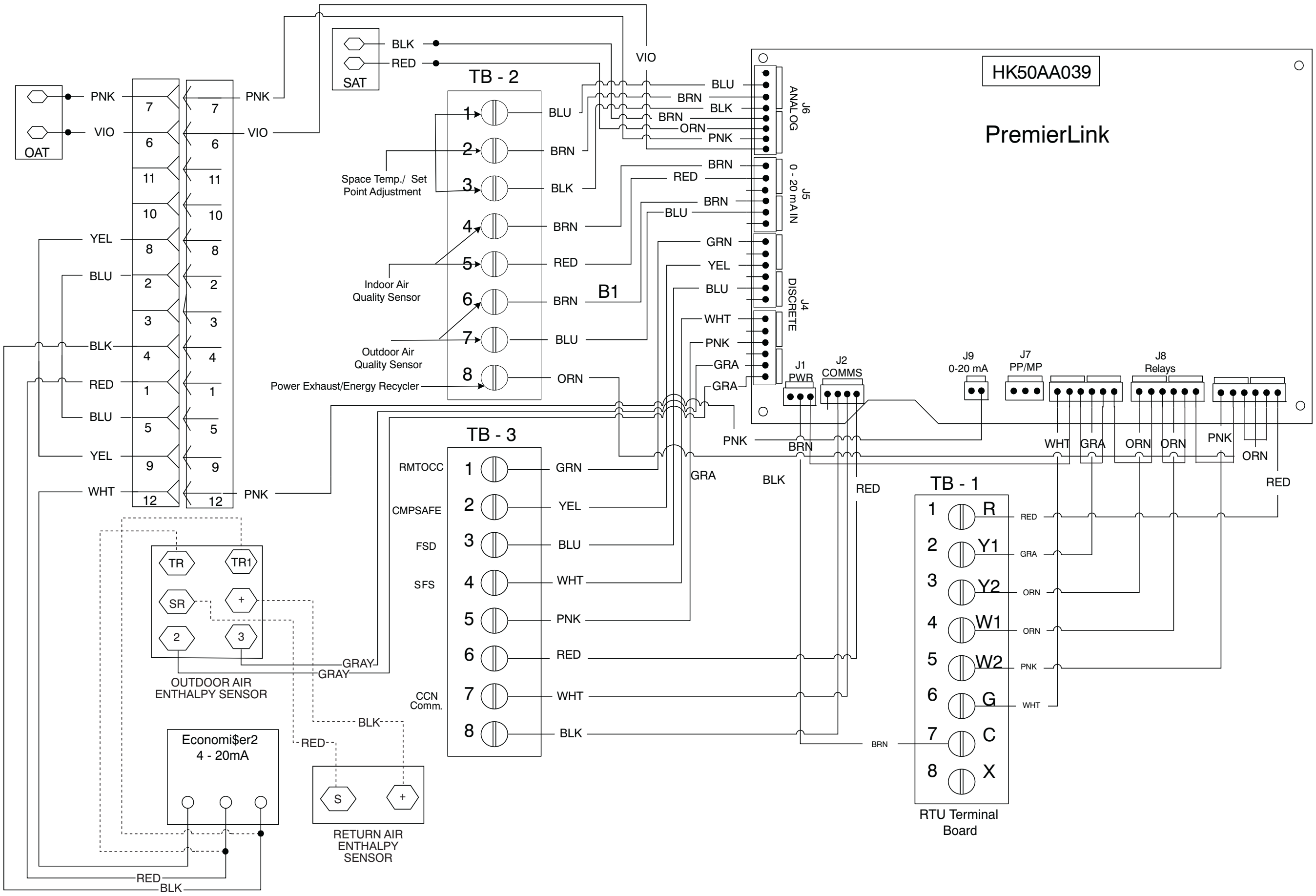

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**Fig. 19 - Typical PremierLink™ Controls Wiring**

**NOTE**: The sensor must be mounted in the discharge airstream downstream of the cooling coil and any heating devices. Be sure the probe tip does not come in contact with any of the unit or heat surfaces.

### Outdoor Air Temperature (OAT) Sensor

When the unit is supplied with a factory-mounted PremierLink control, the outdoor-air temperature sensor (OAT) is factory-supplied and wired.

### Install the Indoor Air Quality ($CO_2$) Sensor

Mount the optional indoor air quality (CO2) sensor according to manufacturer specifications.

A separate field-supplied transformer must be used to power the $CO_2$ sensor.

Wire the $CO_2$ sensor to the COM and IAQI terminals of J5 on the PremierLink controller. Refer to the PremierLink Installation, Start-up, and Configuration Instructions for detailed wiring and configuration information.

### Enthalpy Sensors and Control

The enthalpy control (HH57AC077) is supplied as a field-installed accessory to be used with the economizer damper control option. The outdoor air enthalpy sensor is part of the enthalpy control. The separate field-installed accessory return air enthalpy sensor (HH57AC078) is required for differential enthalpy control.

**NOTE**: The enthalpy control must be set to the "D" setting for differential enthalpy control to work properly.

The enthalpy control receives the indoor and return enthalpy from the outdoor and return air enthalpy sensors and provides a dry contact switch input to the PremierLink controller. Locate the controller in place of an existing economizer controller or near the actuator. The mounting plate may not be needed if existing bracket is used.

A closed contact indicates that outside air is preferred to the return air. An open contact indicates that the economizer should remain at minimum position.

### Outdoor Air Enthalpy Sensor/Enthalpy Controller (HH57AC077)

To wire the outdoor air enthalpy sensor, perform the following (See Fig. 20 and 21):

**NOTE**: The outdoor air sensor can be removed from the back of the enthalpy controller and mounted remotely.

1. Use a 4-conductor, 18 or 20 AWG cable to connect the enthalpy control to the PremierLink controller and power transformer.
2. Connect the following 4 wires from the wire harness located in rooftop unit to the enthalpy controller:
    a. Connect the BRN wire to the 24 vac terminal (TR1) on enthalpy control and to pin 1 on 12-pin harness.
    b. Connect the RED wire to the 24 vac GND terminal (TR) on enthalpy sensor and to pin 4 on 12-pin harness.
    c. Connect the GRAY/ORN wire to J4-2 on Premier Link controller and to terminal (3) on enthalpy sensor.
    d. Connect the GRAY/RED wire to J4-1 on Premier Link controller and to terminal (2) on enthalpy sensor.

**Table 4 – PremierLink™ Sensor Usage**

| APPLICATION | OUTDOOR AIR TEMPERATURE SENSOR | RETURN AIR TEMPERATURE SENSOR | OUTDOOR AIR ENTHALPY SENSOR | RETURN AIR ENTHALPY SENSOR |
|---|---|---|---|---|
| **Dry Bulb Temperature with PremierLink* (PremierLink requires 4-20 mA Actuator)** | Included – HH79NZ017 | — | — | — |
| **Differential Dry Bulb Temperature with PremierLink* (PremierLink requires 4-20 mA Actuator)** | Included – HH79NZ017 | Required – 33ZCT55SPT or Equivalent | — | — |
| **Single Enthalpy with PremierLink* (PremierLink requires 4-20 mA Actuator)** | Included – Not Used | — | Required – HH57AC077 | — |
| **Differential Enthalpy with PremierLink* (PremierLink requires 4-20 mA Actuator)** | Included – Not Used | — | Required – HH57AC077 | Required – HH57AC078 |

*PremierLink control requires Supply Air Temperature sensor 33ZCSENSAT and Outdoor Air Temperature sensor HH79NZ017
— Included with factory-installed PremierLink control; field-supplied and field-installed with field-installed PremierLink control.
NOTES:
1. $CO_2$ Sensors (Optional):
33ZCSENCO2 — Room sensor (adjustable). Aspirator box is required for duct mounting of the sensor.
33ZCASPCO2 — Aspirator box used for duct-mounted $CO_2$ room sensor.
33ZCT55CO2 — Space temperature and $CO_2$ room sensor with override.
33ZCT56CO2 — Space temperature and $CO_2$ room sensor with override and set point.
2. All units include the following Standard Sensors:
Outdoor-Air Sensor — 50HJ540569 — Opens at 67°F, closes at 52°F, not adjustable.
Mixed-Air Sensor — HH97AZ001 — (PremierLink control requires Supply Air Temperature sensor 33ZCSENSAT and Outdoor Air Temperature Sensor HH79NZ017)
Compressor Lockout Sensor — 50HJ540570 — Opens at 35°F, closes at 50°F.

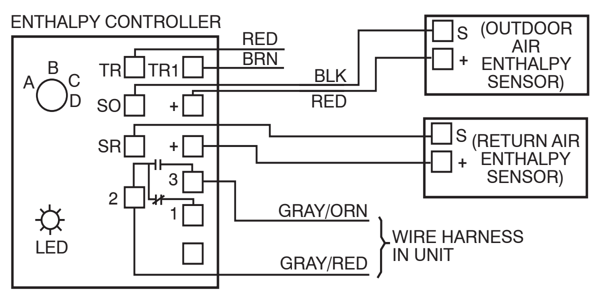
**NOTE**: If installing in a Carrier rooftop, use the two gray wires provided from the control section to the economizer to connect PremierLink controller to terminals 2 and 3 on enthalpy sensor.

### Return Air Enthalpy Sensor

Mount the return-air enthalpy sensor (HH57AC078) in the return-air duct. The return air sensor is wired to the enthalpy controller (HH57AC077). The outdoor enthalpy changeover set point is set at the controller.

To wire the return air enthalpy sensor, perform the following (see Fig. 20):

1. Use a 2-conductor, 18 or 20 AWG, twisted pair cable to connect the return air enthalpy sensor to the enthalpy controller.
2. At the enthalpy control remove the factory-installed resistor from the (SR) and (+) terminals.
3. Connect the field-supplied RED wire to (+) spade connector on the return air enthalpy sensor and the (SR+) terminal on the enthalpy controller. Connect the BLK wire to (S) spade connector on the return air enthalpy sensor and the (SR) terminal on the enthalpy controller.




NOTES:
1. Remove factory-installed jumper across SR and + before connecting wires from return air sensor.
2. Switches shown in high outdoor air enthalpy state. Terminals 2 and 3 close on low outdoor air enthalpy relative to indoor air enthalpy.
3. Remove sensor mounted on back of control and locate in outside air-stream.

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**Fig. 20 - Outdoor and Return Air Sensor Wiring Connections for Differential Enthalpy Control**

48TM-P06

## Optional EconoMi$erIV and EconoMi$er2

See Fig. 22 for EconoMi$er IV component locations. See Fig. 23 for EconoMi$er2 component locations.

**NOTE**: These instructions are for installing the optional EconoMi$er IV and EconoMi$er2 only. Refer to the accessory EconoMi$er IV or EconoMi$er2 installation instructions when field installing an EconoMi$er IV or EconoMi$er2 accessory.

1. To remove the existing unit filter access panel, raise the panel and swing the bottom outward. The panel is now disengaged from the track and can be removed. (See Fig. 24.)
2. The box with the economizer hood components is shipped in the compartment behind the economizer. The EconoMi$er IV controller is mounted on top of the EconoMi$er IV in the position shown in Fig. 22. The optional EconoMi$er2 with 4 to 20 mA actuator signal control does not include the EconoMi$er IV controller. To remove the component box from its shipping position, remove the screw holding the hood box bracket to the top of the economizer. Slide the hood box out of the unit. (See Fig. 25.)

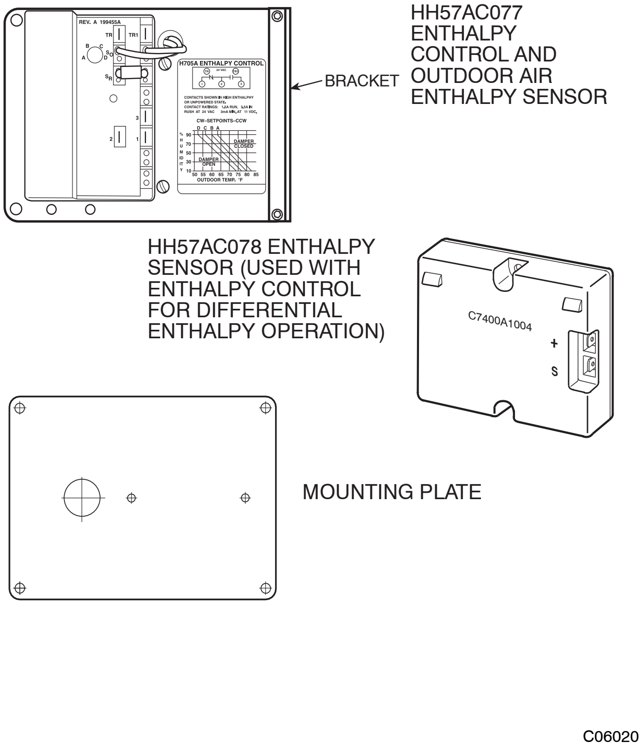



**Fig. 21 - Differential Enthalpy Control, Sensor and Mounting Plate (33AMKITENT006)**

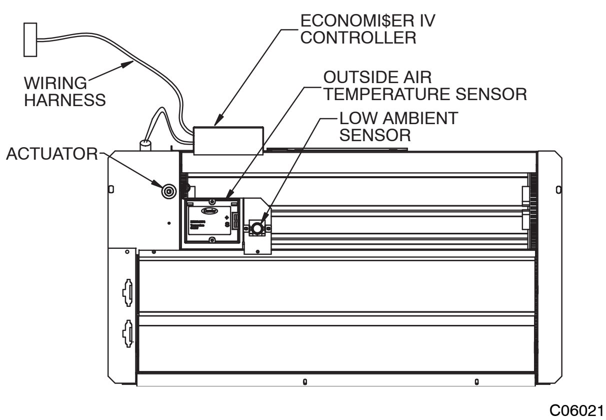



**Fig. 22 - EconoMi$er IV Component Locations**

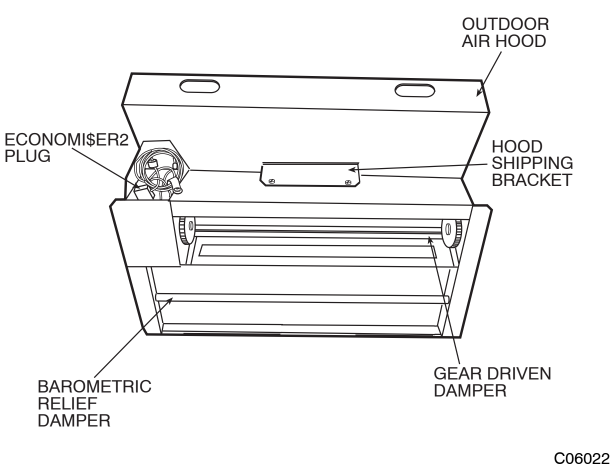



**Fig. 23 - EconoMi$er2 Component Locations**

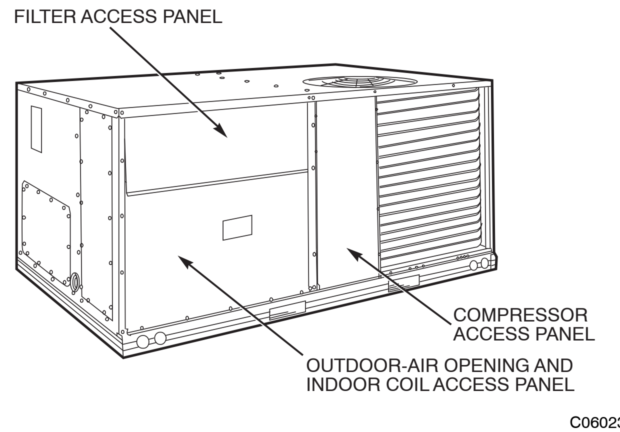



**Fig. 24 - Typical Access Panel Locations**

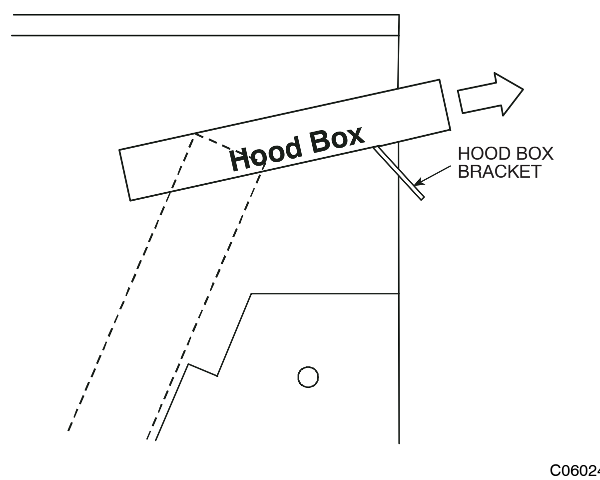



**Fig. 25 - Hood Box Removal**

48TM-P06

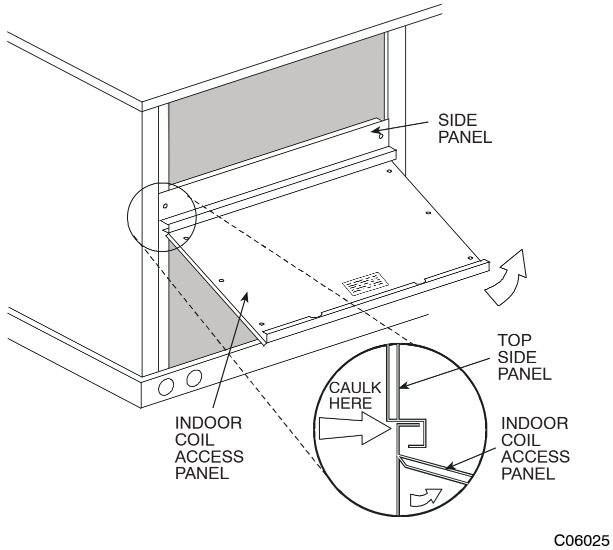



**Fig. 26 – Indoor Coil Access Panel Relocation**

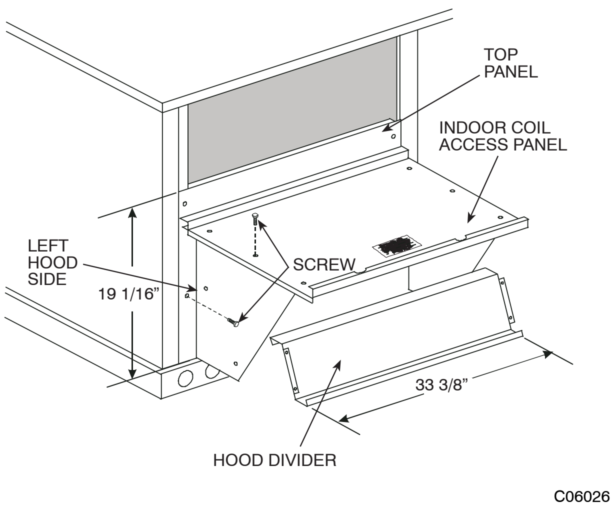



**Fig. 27 – Outdoor-Air Hood Construction**

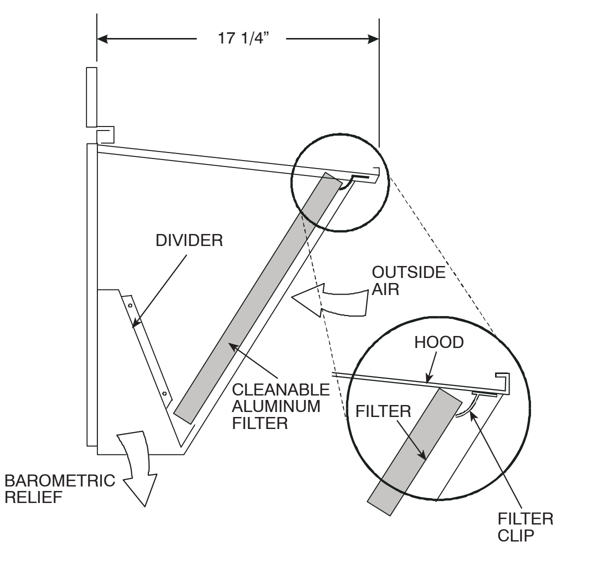



**Fig. 28 – Filter Installation**

**IMPORTANT**: If the power exhaust accessory is to be installed on the unit, the hood shipped with the unit will not be used and must be discarded. Save the aluminum filter for use in the power exhaust hood assembly.

3. The indoor coil access panel will be used as the top of the hood. Remove the screws along the sides and bottom of the indoor coil access panel. (See Fig. 26.)
4. Swing out indoor coil access panel and insert the hood sides under the panel (hood top). Use the screws provided to attach the hood sides to the hood top. Use screws provided to attach the hood sides to the unit. (See Fig. 27.)
5. Remove the shipping tape holding the economizer barometric relief damper in place.
6. Insert the hood divider between the hood sides. (See Fig. 27 and 28.) Secure hood divider with 2 screws on each hood side. The hood divider is also used as the bottom filter rack for the aluminum filter.
7. Open the filter clips which are located underneath the hood top. Insert the aluminum filter into the bottom filter rack (hood divider). Push the filter into position past the open filter clips. Close the filter clips to lock the filter into place. (See Fig. 28.)
8. Caulk the ends of the joint between the unit top panel and the hood top. (See Fig. 26.)
9. Replace the filter access panel.
10. Install all EconoMi$er IV accessories. EconoMi$er IV wiring is shown in Fig. 29. EconoMi$er2 wiring is shown in Fig. 30.

Barometric flow capacity is shown in Fig. 31. Outdoor air leakage is shown in Fig. 32. Return air pressure drop is shown in Fig. 33.

## EconoMi$er IV Standard Sensors

### Outdoor Air Temperature (OAT) Sensor

The outdoor air temperature sensor (HH57AC074) is a 10 to 20 mA device used to measure the outdoor-air temperature. The outdoor-air temperature is used to determine when the EconoMi$er IV can be used for free cooling. The sensor is factory-installed on the EconoMi$er IV in the outdoor airstream. (See Fig. 22.) The operating range of temperature measurement is 40° to 100°F.

### Supply Air Temperature (SAT) Sensor

The supply air temperature sensor is a 3 K thermistor located at the inlet of the indoor fan. (See Fig. 34.) This sensor is factory installed. The operating range of temperature measurement is 0° to 158°F. See Table 5 for sensor temperature/resistance values.

The temperature sensor looks like an eyelet terminal with wires running to it. The sensor is located in the “crimp end” and is sealed from moisture.

### Outdoor Air Lockout Sensor

The EconoMi$er IV is equipped with an ambient temperature lockout switch located in the outdoor airstream which is used to lock out the compressors below a 42°F ambient temperature. (See Fig. 22.)

## EconoMi$er IV Control Modes

**IMPORTANT**: The optional EconoMi$er2 does not include a controller. The EconoMi$er2 is operated by a 4 to 20 mA signal from an existing field-supplied controller (such as PremierLink™ control). See Fig. 30 for wiring information.

Determine the EconoMi$er IV control mode before set up of the control. Some modes of operation may require different sensors. (See Table 4.) The EconoMi$er IV is supplied from the factory with a supply-air temperature sensor and an outdoor- air temperature sensor. This allows for operation of the EconoMi$er IV with outdoor air dry bulb changeover control. Additional accessories can be added to allow for different types of changeover control and operation of the EconoMi$er IV and unit.

**Table 5 – Supply Air Sensor Temperature/ Resistance Values**

| TEMPERATURE (F) | RESISTANCE (ohms) |
|---|---|
| –58 | 200,250 |
| –40 | 100,680 |
| –22 | 53,010 |
| –4 | 29,091 |
| 14 | 16,590 |
| 32 | 9,795 |
| 50 | 5,970 |
| 68 | 3,747 |
| 77 | 3,000 |
| 86 | 2,416 |
| 104 | 1,597 |
| 122 | 1,080 |
| 140 | 746 |
| 158 | 525 |
| 176 | 376 |
| 185 | 321 |
| 194 | 274 |
| 212 | 203 |
| 230 | 153 |
| 248 | 116 |
| 257 | 102 |
| 266 | 89 |
| 284 | 70 |
| 302 | 55 |

**Table 6 – EconoMi$er IV Sensor Usage**

| APPLICATION | ECONOMI$ER IV WITH OUTDOOR AIR DRY BULB SENSOR |
|---|---|
| | Accessories Required |
| Outdoor Air Dry Bulb | None. The outdoor air dry bulb sensor is factory installed. |
| Differential Dry Bulb | CRTEMPSN002A00* |
| Single Enthalpy | HH57AC078 |
| Differential Enthalpy | HH57AC078 and CRENTDIF004A00* |
| $CO_2$ for DCV Control using a Wall-Mounted $CO_2$ Sensor | 33ZCSENCO2 |
| $CO_2$ for DCV Control using a Duct-Mounted $CO_2$ Sensor | 33ZCSENCO2† and 33ZCASPCO2** OR CRCBDIOX005A00†† |

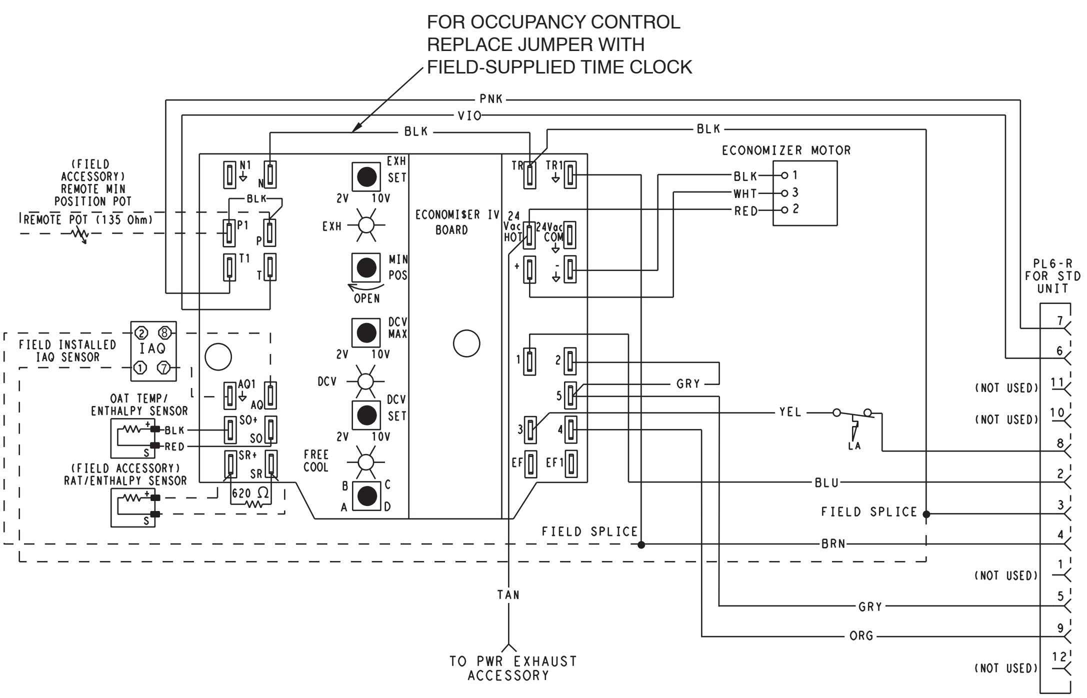
*CRENTDIF004A00 and CRTEMPSN002A00 accessories are used on many different base units. As such, these kits may contain parts that will not be needed for installation.

† 33ZCSENCO2 is an accessory $CO_2$ sensor.

** 33ZCASPCO2 is an accessory aspirator box required for duct-mounted applications.

†† CRCBDIOX005A00 is an accessory that contains both 33ZCSENCO2 and 33ZCASPCO2 accessories.






LEGEND

**DCV**— Demand Controlled Ventilation
**IAQ** — Indoor Air Quality
**LA** — Low Ambient Lockout Device
**OAT** — Outdoor-Air Temperature
**POT** — Potentiometer
**RAT** — Return-Air Temperature

Potentiometer Defaults Settings:

| | |
|---|---|
| Power Exhaust | Middle |
| Minimum Pos. | Fully Closed |
| DCV Max. | Middle |
| DCV Set | Middle |
| Enthalpy | C Setting |

NOTES:
1. 620 ohm, 1 watt 5% resistor should be removed only when using differential enthalpy or dry bulb.
2. If a separate field-supplied 24 v transformer is used for the IAQ sensor power supply, it cannot have the secondary of the transformer grounded.
3. For field-installed remote minimum position POT, remove black wire jumper between P and P1 and set control minimum position POT to the minimum position.

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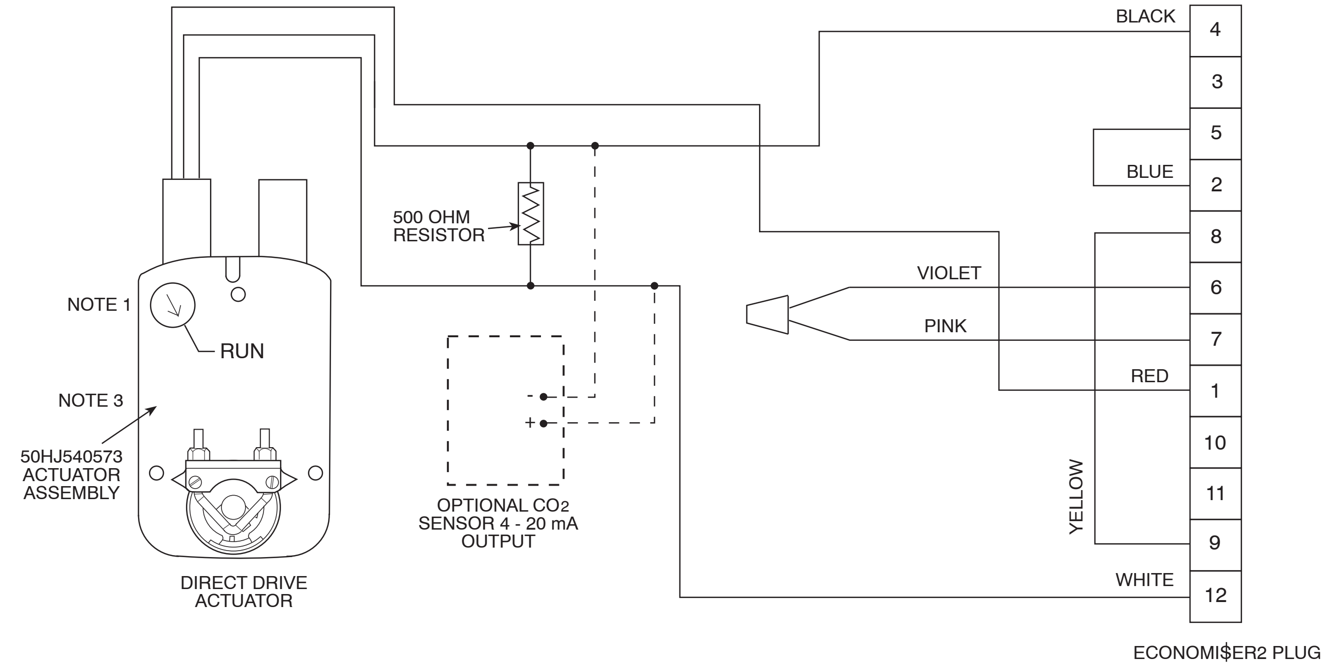
**Fig. 29 - EconoMi$er IV Wiring**




NOTES:
1. Switch on actuator must be in run position for economizer to operate.
2. PremierLink™ control requires that the standard 50HJ540569 outside-air sensor be replaced by either the CROASENR001A00 dry bulb sensor or HH57A077 enthalpy sensor.
3. 50HJ540573 actuator consists of the 50HJ540567 actuator and a harness with 500-ohm resistor.

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**Fig. 30 - EconoMi$er2 with 4 to 20 mA Control Wiring**

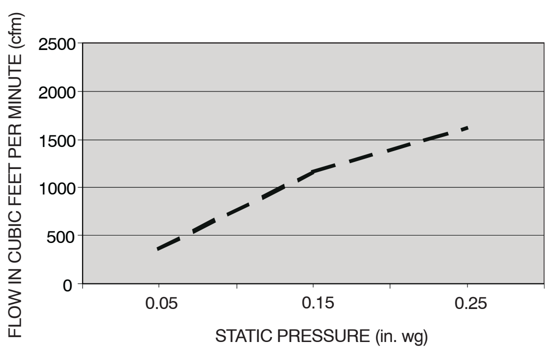


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**Fig. 31 - Barometric Flow Capacity**

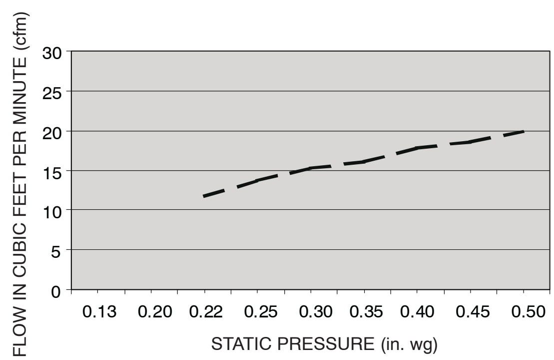


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**Fig. 32 - Outdoor-Air Damper Leakage**

**Outdoor Dry Bulb Changeover**

The standard controller is shipped from the factory configured for outdoor dry bulb changeover control. The outdoor air and supply air temperature sensors are included as standard. For this control mode, the outdoor temperature is compared to an adjustable set point selected on the control. If the outdoor-air temperature is above the set point, the EconoMi$er IV will adjust the outside air dampers to minimum position. If the outdoor-air temperature is below the set point, the position of the outside air dampers will be controlled to provided free cooling using outdoor air. When in this mode, the LED next to the free cooling set point potentiometer will be on. The changeover temperature set point is controlled by the free cooling set point potentiometer located on the control. (See Fig. 35.) The scale on the potentiometer is A, B, C, and D. See Fig. 36 for the corresponding temperature changeover values.

**Differential Dry Bulb Control**

For differential dry bulb control the standard outdoor dry bulb sensor is used in conjunction with an additional accessory dry bulb sensor (part number CRTEMPSN002A00). The accessory sensor must be mounted in the return airstream. (See Fig. 37.) Wiring is provided in the EconoMi$er IV wiring harness. (See Fig. 29.)

In this mode of operation, the outdoor-air temperature is compared to the return-air temperature and the lower temperature airstream is used for cooling. When using this mode of changeover control, turn the enthalpy setpoint potentiometer fully clockwise to the D setting. (See Fig. 35.)

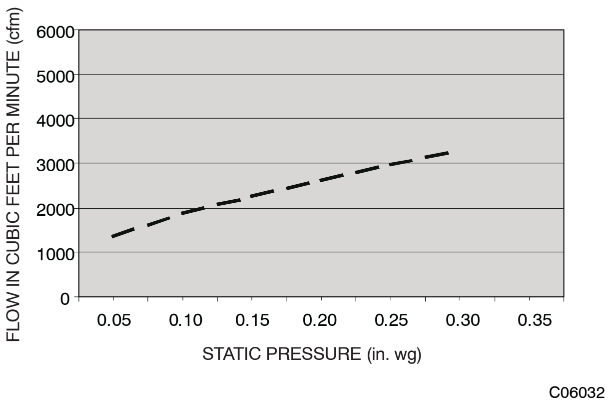


**Fig. 33 - Return-Air Pressure Drop**

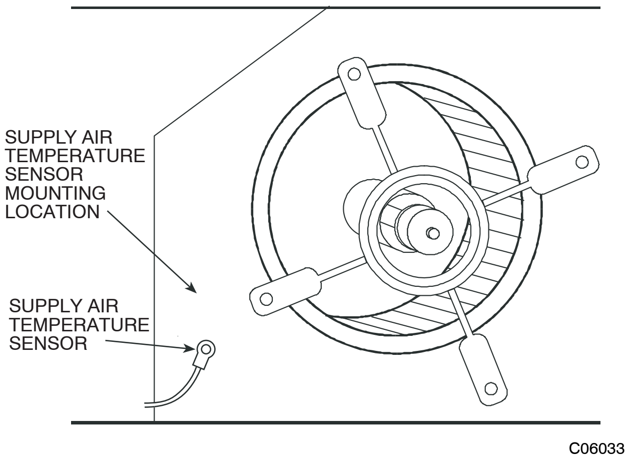


**Fig. 34 - Supply Air Sensor Location**

**Outdoor Enthalpy Changeover**

For enthalpy control, accessory enthalpy sensor (part number HH57AC078) is required. Replace the standard outdoor dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. (See Fig. 21.) When the outdoor air enthalpy rises above the outdoor enthalpy changeover set point, the outdoor-air damper moves to its minimum position. The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point potentiometer on the EconoMi$er IV controller. The set points are A, B, C, and D. (See Fig. 38.) The factory-installed 620-ohm jumper must be in place across terminals $S_R$ and SR+ on the EconoMi$er IV controller. (See Fig. 22 and 39.)

**Differential Enthalpy Control**

For differential enthalpy control, the EconoMi$er IV controller uses two enthalpy sensors (HH57AC078 and CRENTDIF004A00), one in the outside air and one in the return air duct. The EconoMi$er IV controller compares the outdoor air enthalpy to the return air enthalpy to determine EconoMi$er IV use. The controller selects the lower enthalpy air (return or outdoor) for cooling. For example, when the outdoor air has a lower enthalpy than the return air, the EconoMi$er IV opens to bring in outdoor air for free cooling.

Replace the standard outside air dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. (See Fig. 22.) Mount the return air enthalpy sensor in the return air duct. (See Fig. 37.) Wiring is provided in the EconoMi$er IV wiring harness. (See Fig. 29.) The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point potentiometer on the EconoMi$er IV controller. When using this mode of changeover control, turn the enthalpy set point potentiometer fully clockwise to the D setting.

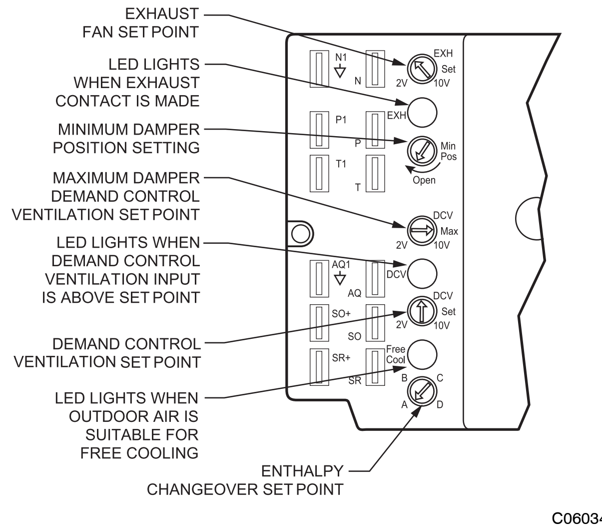


**Fig. 35 - EconoMi$er IV Controller Potentiometer and LED Locations**

**Indoor Air Quality (IAQ) Sensor Input**

The IAQ input can be used for demand control ventilation control based on the level of $CO_2$ measured in the space or return air duct.

Mount the accessory IAQ sensor according to manufacturer specifications. The IAQ sensor should be wired to the AQ and AQ1 terminals of the controller. Adjust the DCV potentiometers to correspond to the DCV voltage output of the indoor air quality sensor at the user-determined set point. (See Fig. 40.)

If a separate field-supplied transformer is used to power the IAQ sensor, the sensor must not be grounded or the EconoMi$er IV control board will be damaged.

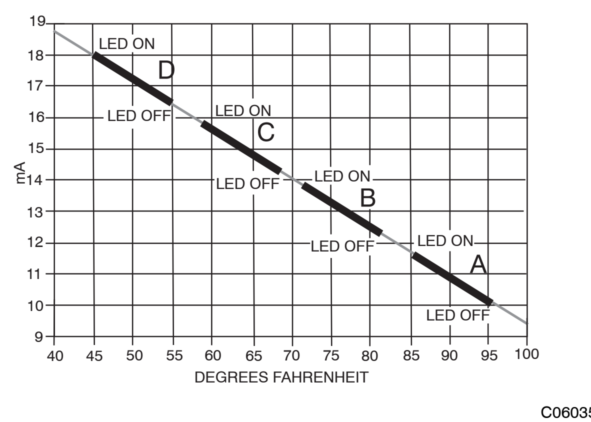


**Fig. 36 - Temperature Changeover Set Points**

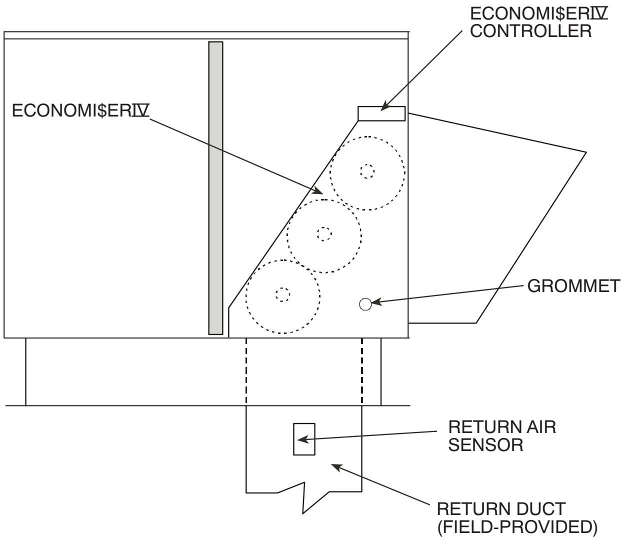

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**Fig. 37 - Return Air Temperature or Enthalpy Sensor Mounting Location**

When using demand ventilation, the minimum damper position represents the minimum ventilation position for VOC (volatile organic compounds) ventilation requirements. The maximum demand ventilation position is used for fully occupied ventilation.

When demand ventilation control is not being used, the minimum position potentiometer should be used to set the occupied ventilation position. The maximum demand ventilation position should be turned fully clockwise.

**Exhaust Set Point Adjustment**

The exhaust set point will determine when the exhaust fan runs based on damper position (if accessory power exhaust is installed). The set point is modified with the Exhaust Fan Set Point (EXH SET) potentiometer. (See Fig. 35.) The set point represents the damper position above which the exhaust fans will be turned on. When there is a call for exhaust, the EconoMi$er IV controller provides a 45 ± 15 second delay before exhaust fan activation to allow the dampers to open. This delay allows the damper to reach the appropriate position to avoid unnecessary fan overload.

**Minimum Position Control**

There is a minimum damper position potentiometer on the EconoMi$er IV controller. (See Fig. 35.) The minimum damper position maintains the minimum airflow into the building during the occupied period.

When using demand ventilation, the minimum damper position represents the minimum ventilation position for VOC (volatile organic compound) ventilation requirements. The maximum demand ventilation position is used for fully occupied ventilation.

When demand ventilation control is not being used, the minimum position potentiometer should be used to set the occupied ventilation position. The maximum demand ventilation position should be turned fully clockwise.

Adjust the minimum position potentiometer to allow the minimum amount of outdoor air, as required by local codes, to enter the building. Make minimum position adjustments with at least 10°F temperature difference between the outdoor and return-air temperatures.

To determine the minimum position setting, perform the following procedure:

1. Calculate the appropriate mixed air temperature using the following formula:

$$(T_O \times \frac{OA}{100}) + (TR \times \frac{RA}{100}) = T_M$$

$T_O$ = Outdoor-Air Temperature
OA = Percent of Outdoor Air
$T_R$ = Return-Air Temperature
RA = Percent of Return Air
$T_M$ = Mixed-Air Temperature

As an example, if local codes require 10% outdoor air during occupied conditions, outdoor-air temperature is 60° F, and return-air temperature is 75°F.

(60 x .10) + (75 x .90) = 73.5°F

2. Disconnect the supply air sensor from terminals T and T1.
3. Ensure that the factory-installed jumper is in place across terminals P and P1. If remote damper positioning is being used, make sure that the terminals are wired according to Fig. 29 and that the minimum position potentiometer is turned fully clockwise.
4. Connect 24 vac across terminals TR and TR1.
5. Carefully adjust the minimum position potentiometer until the measured mixed air temperature matches the calculated value.
6. Reconnect the supply air sensor to terminals T and T1.

Remote control of the EconoMi$er IV damper is desirable when requiring additional temporary ventilation. If a field-supplied remote potentiometer (Honeywell part number S963B1128) is wired to the EconoMi$er IV controller, the minimum position of the damper can be controlled from a remote location.

To control the minimum damper position remotely, remove the factory-installed jumper on the P and P1 terminals on the EconoMi$er IV controller. Wire the field-supplied potentiometer to the P and P1 terminals on the EconoMi$er IV controller. (See Fig. 39.)

**Damper Movement**

Damper movement from full open to full closed (or vice versa) takes $2^1/_2$ minutes.

**Thermostats**

The EconoMi$er IV control works with conventional thermostats that have a Y1 (cool stage 1), Y2 (cool stage 2), W1 (heat stage 1), W2 (heat stage 2), and G (fan). The EconoMi$er IV control does not support space temperature sensors. Connections are made at the thermostat terminal connection board located in the main control box.

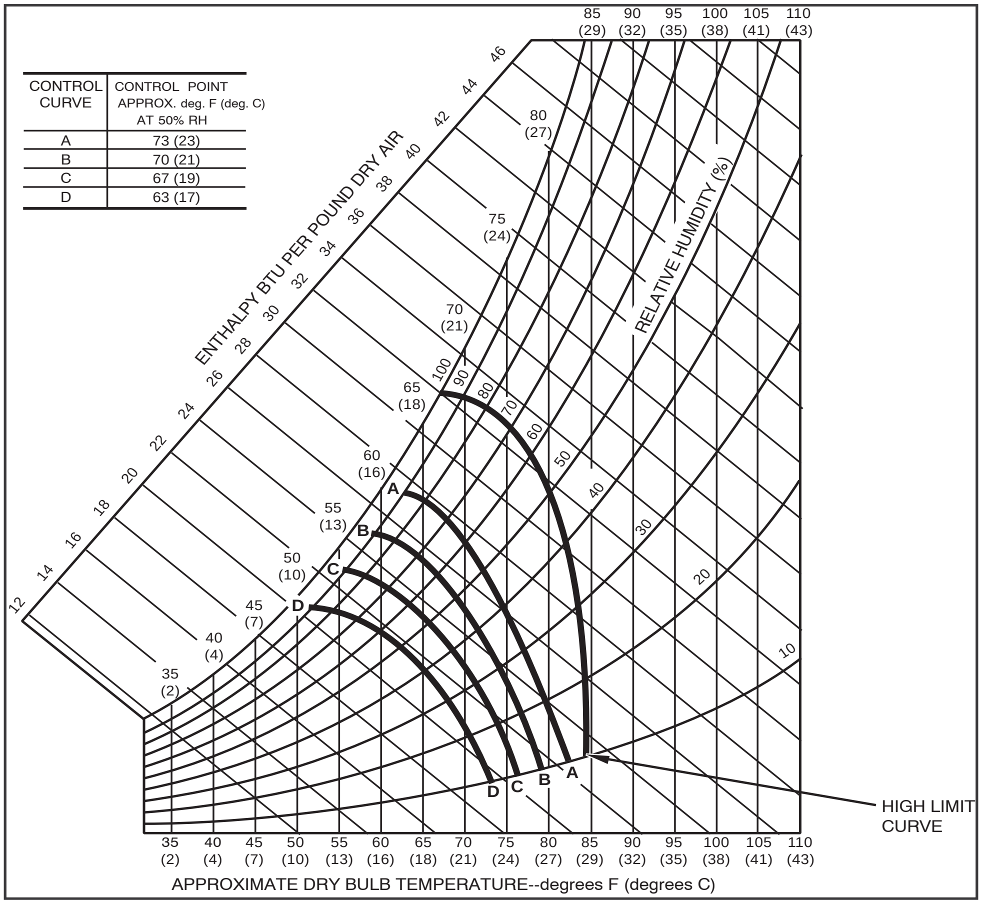



**Fig. 38 - Enthalpy Changeover Set Points**

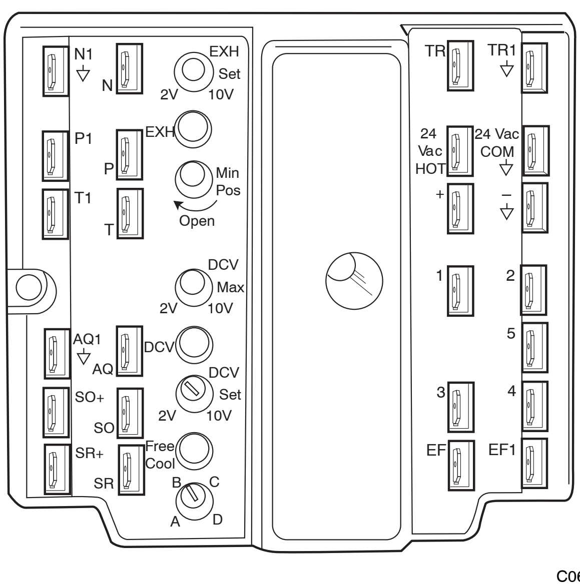



**Fig. 39 - EconoMi$er IV Control**

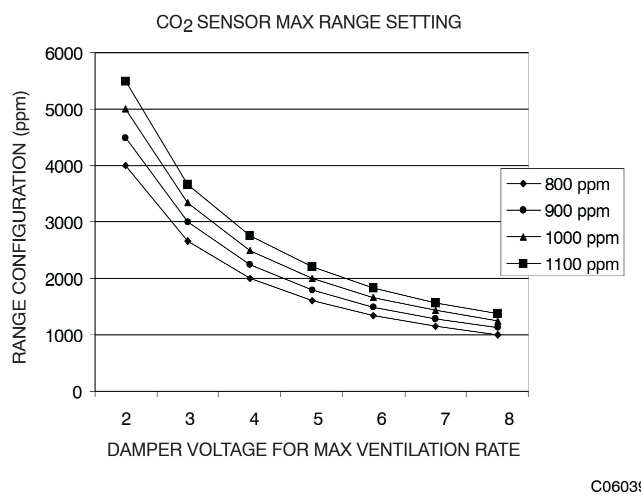



**Fig. 40 - $CO_2$ Sensor Maximum Range Settings**

### Occupancy Control

The factory default configuration for the EconoMi$er IV control is occupied mode. Occupied status is provided by the black jumper from terminal TR to terminal N. When unoccupied mode is desired, install a field-supplied timeclock function in place of the jumper between TR and N. (See Fig. 29.) When the timeclock contacts are closed, the EconoMi$er IV control will be in occupied mode. When the timeclock contacts are open (removing the 24-v signal from terminal N), the EconoMi$er IV will be in unoccupied mode.

### Demand Control Ventilation (DCV)

When using the EconoMi$er IV for demand controlled ventilation, there are some equipment selection criteria which should be considered. When selecting the heat capacity and cool capacity of the equipment, the maximum ventilation rate must be evaluated for design conditions. The maximum damper position must be calculated to provide the desired fresh air.

Typically the maximum ventilation rate will be about 5 to 10% more than the typical cfm required per person, using normal outside air design criteria.

A proportional anticipatory strategy should be taken with the following conditions: a zone with a large area, varied occupancy, and equipment that cannot exceed the required ventilation rate at design conditions. Exceeding the required ventilation rate means the equipment can condition air at a maximum ventilation rate that is greater than the required ventilation rate for maximum occupancy. A proportional-anticipatory strategy will cause the fresh air supplied to increase as the room $CO_2$ level increases even though the $CO_2$ set point has not been reached. By the time the $CO_2$ level reaches the set point, the damper will be at maximum ventilation and should maintain the set point.

In order to have the $CO_2$ sensor control the economizer damper in this manner, first determine the damper voltage output for minimum or base ventilation. Base ventilation is the ventilation required to remove contaminants during unoccupied periods. The following equation may be used to determine the percent of outside air entering the building for a given damper position. For best results there should be at least a 10 degree difference in outside and return-air temperatures.

$$(T_O \times \frac{OA}{100}) + (TR \times \frac{RA}{100}) = T_M$$

$T_O$ = Outdoor-Air Temperature

OA = Percent of Outdoor Air

$T_R$ = Return-Air Temperature

RA = Percent of Return Air

$T_M$ = Mixed-Air Temperature

Once base ventilation has been determined, set the minimum damper position potentiometer to the correct position.

The same equation can be used to determine the occupied or maximum ventilation rate to the building. For example, an output of 3.6 volts to the actuator provides a base ventilation rate of 5% and an output of 6.7 volts provides the maximum ventilation rate of 20% (or base plus 15 cfm per person). Use Fig. 40 to determine the maximum setting of the $CO_2$ sensor. For example, an 1100 ppm set point relates to a 15 cfm per person design. Use the 1100 ppm curve on Fig. 40 to find the point when the $CO_2$ sensor output will be 6.7 volts. Line up the point on the graph with the left side of the chart to determine that the range configuration for the $CO_2$ sensor should be 1800 ppm. The EconoMi$er IV controller will output the 6.7 volts from the $CO_2$ sensor to the actuator when the $CO_2$ concentration in the space is at 1100 ppm. The DCV set point may be left at 2 volts since the $CO_2$ sensor voltage will be ignored by the EconoMi$er IV controller until it rises above the 3.6 volt setting of the minimum position potentiometer.

Once the fully occupied damper position has been determined, set the maximum damper demand control ventilation potentiometer to this position. Do not set to the maximum position as this can result in over-ventilation to the space and potential high humidity levels.

**$CO_2$ Sensor Configuration**

The $CO_2$ sensor has preset standard voltage settings that can be selected anytime after the sensor is powered up. (See Table 6.)

Use setting 1 or 2 for Carrier equipment. (See Table 6.)

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to select the preset number. (See Table 6.)
4. Press Enter to lock in the selection.
5. Press Mode to exit and resume normal operation.

The custom settings of the $CO_2$ sensor can be changed anytime after the sensor is energized. Follow the steps below to change the non-standard settings:

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to toggle to the NONSTD menu and press Enter.
4. Use the Up/Down button to toggle through each of the nine variables, starting with Altitude, until the desired setting is reached.
5. Press Mode to move through the variables.
6. Press Enter to lock in the selection, then press Mode to continue to the next variable.

**Dehumidification of Fresh Air with DCV (Demand Controlled Ventilation) Control**

If normal rooftop heating and cooling operation is not adequate for the outdoor humidity level, an energy recovery unit and/or a dehumidification option should be considered.

## Step 9 — Adjust Evaporator−Fan Speed

Adjust evaporator−fan rpm to meet jobsite conditions. Table 8 shows fan rpm at motor pulley settings. Table 9 shows motor performance data. See Table 10 for accessory and option static pressure drops. See Table 9 for evaporator motor efficiency. Refer to Tables 11−14 to determine fan speed settings.

### Belt−Drive Motors

Fan motor pulleys are factory set for speed shown in Table 1. See Fig. 42 for belt drive motor location.

**NOTE**: Before adjusting fan speed, make sure the new fan speed will provide an air temperature rise range as shown in Table 1.

To change fan speed:

1. Shut off unit power supply.
2. Loosen belt by loosening fan motor mounting nuts. (See Fig. 42.)
3. Loosen movable pulley flange setscrew. (See Fig. 43.)
4. Screw movable flange toward fixed flange to increase speed and away from fixed flange to decrease speed. Increasing fan speed increases load on motor. Do not exceed maximum speed specified in Table 1.
5. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Table 1 for speed change for each full turn of pulley flange.)

## Table 7 – $CO_2$ Sensor Standard Settings

| SETTING | EQUIPMENT | OUTPUT | VENTILATION RATE (cfm/Person) | ANALOG OUTPUT | $CO_2$ CONTROL RANGE (ppm) | OPTIONAL RELAY SETPOINT (ppm) | RELAY HYSTERESIS (ppm) |
|---|---|---|---|---|---|---|---|
| 1 | Interface w/Standard Building Control System | Proportional | Any | 0-10V 4-20 mA | 0-2000 | 1000 | 50 |
| 2 | | Proportional | Any | 2-10V 7-20 mA | 0-2000 | 1000 | 50 |
| 3 | | Exponential | Any | 0-10V 4-20 mA | 0-2000 | 1100 | 50 |
| 4 | Economizer | Proportional | 15 | 0-10V 4-20 mA | 0-1100 | 1100 | 50 |
| 5 | | Proportional | 20 | 0-10V 4-20 mA | 0- 900 | 900 | 50 |
| 6 | | Exponential | 15 | 0-10V 4-20 mA | 0-1100 | 1100 | 50 |
| 7 | | Exponential | 20 | 0-10V 4-20 mA | 0- 900 | 900 | 50 |
| 8 | Health & Safety | Proportional | — | 0-10V 4-20 mA | 0-9999 | 5000 | 500 |
| 9 | Parking/Air Intakes/ Loading Docks | Proportional | — | 0-10V 4-20 mA | 0-2000 | 700 | 50 |

LEGEND
**ppm** – – Parts Per Million



## Table 8 – Fan Rpm at Motor Pulley Settings*

| UNIT | MOTOR PULLEY TURNS OPEN | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1/2 | 1 | 1–1/2 | 2 | 2–1/2 | 3 | 3–1/2 | 4 | 4–1/2 | 5 |
| 48TM–P06† | 1192 | 1163 | 1131 | 1099 | 1067 | 1035 | 1003 | 971 | 909 | 907 | 875 |
| 48TM–P06** | 1685 | 1647 | 1608 | 1570 | 1531 | 1493 | 1454 | 1416 | 1377 | 1339 | 1300 |

* Approximate fan rpm shown.
† Indicates standard motor and drive package.
** Indicates high–static motor and drive package

To align fan and motor pulleys:

1. Loosen fan pulley setscrews.
2. Slide fan pulley along fan shaft.
3. Make angular alignment by loosening motor from mounting.

To adjust belt tension:

1. Loosen fan motor mounting nuts.
2. Slide motor mounting plate away from fan scroll for proper belt tension (1/2-in. deflection with one finger).
3. Tighten motor mounting nuts.
4. Adjust bolt and tighten nut to secure motor in fixed position.

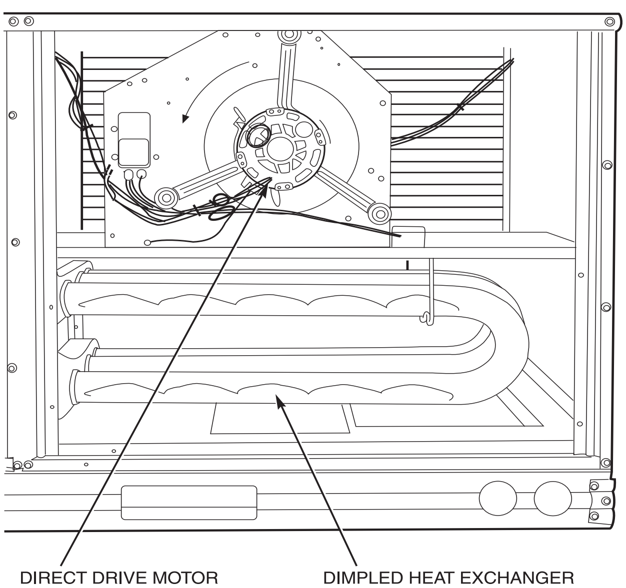



**Fig. 41 - Direct Drive Motor Mounting**

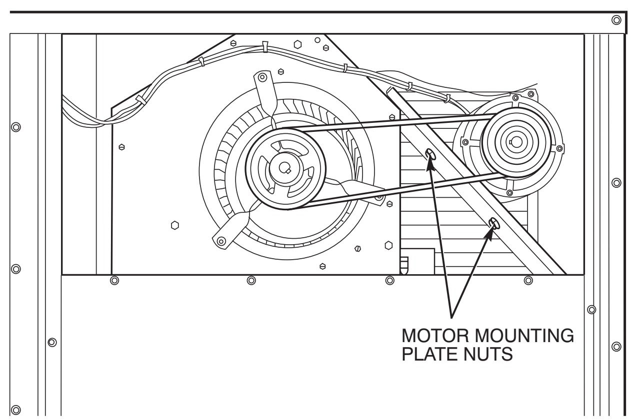



**Fig. 42 - Belt-Drive Motor Mounting**

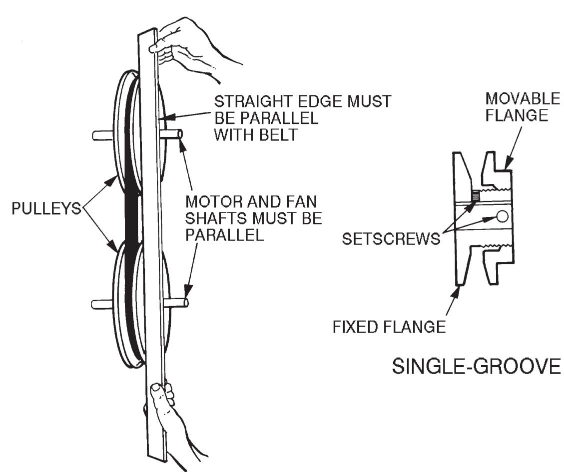



**Fig. 43 - Evaporator-Fan Pulley Adjustment**

### Table 9 – Evaporator-Fan Motor Performance

| UNIT | EVAPORATOR-- FAN MOTOR | UNIT VOLTAGE | MAXIMUM ACCEPTABLE CONTINUOUS BHP* | MAXIMUM ACCEPTABLE OPERATING WATTS | MAXIMUM AMP DRAW | EFFICIENCY |
|---|---|---|---|---|---|---|
| 48TM–P06 | Standard | 208/230 | 2.40 | 2120 | 5.2 | 84 |
| | | 460 | | | 2.6 | 84 |
| | High Static | 208/230 | 2.90 | 2562 | 8.6 | 84 |
| | | 460 | | | 3.9 | 84 |

LEGEND
Bhp – Brake Horsepower
* Extensive motor and electrical testing on these units ensures that the full horsepower range of the motors can be utilized with confidence. Using the fan motors up to the horsepower ratings shown in this table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

48TM–P06

### Table 10 – Accessory/FIOP EconoMi$er IV and EconoMi$er2 Static Pressure* (in. wg)

| COMPONENT | CFM | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1250 | 1500 | 1750 | 2000 | 2250 | 2500 | 2750 | 3000 |
| **Vertical EconoMi$er IV and EconoMi$er2** | 0.045 | 0.065 | 0.08 | 0.12 | 0.145 | 0.175 | 0.22 | 0.255 |
| **Horizontal EconoMi$er IV and EconoMi$er2** | — | — | 0.1 | 0.125 | 0.15 | 0.18 | 0.225 | 0.275 |

LEGEND
**FIOP** – Factory–Installed Option
* The static pressure must be added to external static pressure. The sum and the evaporator entering air cfm should be used in conjunction with the Fan
Performance tables to determine indoor blower rpm and watts.

## GENERAL NOTES FOR FAN PERFORMANCE DATA TABLES

1. Values include losses for filters, unit casing, and wet coils.
2. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected. See Table 8 for additional information.
3. Use of a field-supplied motor may affect wire sizing. Contact your local Carrier representative for details.
4. Interpolation is permissible. Do not extrapolate.

## Table 11 – Fan Perfomance 48TM-P06 Three Phase — Vertical Discharge Units; Standard Motor (Belt Drive)

| AIRFLOW (Cfm) | EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts |
| **1500** | **802** | **0.42** | **370** | 912 | 0.55 | 489 | 1006 | 0.70 | 624 | 1088 | 0.87 | 773 | 1163 | 1.05 | 935 |
| **1600** | **840** | **0.49** | **432** | 947 | 0.63 | 557 | 1038 | 0.78 | 696 | 1119 | 0.95 | 848 | **1193** | **1.14** | **1013** |
| **1700** | 878 | 0.57 | 502 | 982 | 0.71 | 632 | 1071 | 0.87 | 776 | 1151 | 1.05 | 932 | **1224** | **1.24** | **1100** |
| **1800** | 917 | 0.65 | 581 | 1017 | 0.81 | 716 | 1105 | 0.97 | 864 | 1183 | 1.15 | 1024 | **1255** | **1.35** | **1197** |
| **1900** | 956 | 0.75 | 668 | 1053 | 0.91 | 808 | 1139 | 1.08 | 961 | **1216** | **1.27** | **1126** | **1287** | **1.47** | **1302** |
| **2000** | 995 | 0.86 | 764 | 1090 | 1.02 | 910 | 1173 | 1.20 | 1067 | **1249** | **1.39** | **1236** | **1319** | **1.59** | **1416** |
| **2100** | 1035 | 0.98 | 869 | 1127 | 1.15 | 1021 | 1209 | 1.33 | 1183 | **1283** | **1.53** | **1357** | **1351** | **1.74** | **1541** |
| **2200** | 1075 | 1.11 | 984 | 1164 | 1.29 | 1141 | 1244 | 1.47 | 1309 | **1317** | **1.68** | **1488** | **1385** | **1.89** | **1676** |
| **2300** | 1115 | 1.25 | 1110 | 1202 | 1.43 | **1273** | **1280** | **1.63** | **1446** | **1352** | **1.83** | **1629** | **1418** | **2.05** | **1822** |
| **2400** | 1155 | 1.40 | **1246** | **1240** | **1.59** | **1415** | **1316** | **1.79** | **1594** | **1387** | **2.01** | **1782** | **1452** | **2.23** | **1980** |
| **2500** | 1196 | 1.57 | **1394** | **1278** | **1.77** | **1569** | **1353** | **1.97** | **1753** | **1422** | **2.19** | **1946** | — | — | — |

| AIRFLOW (Cfm) | EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts |
| **1500** | **1232** | **1.25** | **1109** | **1297** | **1.46** | **1295** | **1357** | **1.68** | **1492** | **1415** | **1.91** | **1700** | **1469** | **2.16** | **1917** |
| **1600** | **1262** | **1.34** | **1190** | **1325** | **1.55** | **1379** | **1385** | **1.78** | **1579** | **1442** | **2.01** | **1788** | **1496** | **2.26** | **2009** |
| **1700** | **1291** | **1.44** | **1281** | **1354** | **1.66** | **1472** | **1414** | **1.89** | **1674** | **1470** | **2.12** | **1887** | **1524** | **2.37** | **2109** |
| **1800** | **1322** | **1.55** | **1380** | **1384** | **1.77** | **1575** | **1443** | **2.00** | **1779** | **1499** | **2.25** | **1994** | — | — | — |
| **1900** | **1352** | **1.68** | **1489** | **1414** | **1.90** | **1687** | **1472** | **2.13** | **1894** | **1528** | **2.38** | **2112** | — | — | — |
| **2000** | **1384** | **1.81** | **1607** | **1445** | **2.04** | **1808** | **1502** | **2.27** | **2019** | — | — | — | — | — | — |
| **2100** | **1415** | **1.95** | **1736** | **1476** | **2.18** | **1940** | — | — | — | — | — | — | — | — | — |
| **2200** | **1448** | **2.11** | **1875** | **1507** | **2.35** | **2083** | — | — | — | — | — | — | — | — | — |
| **2300** | **1480** | **2.28** | **2025** | — | — | — | — | — | — | — | — | — | — | — | — |
| **2400** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **2500** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

LEGEND
**Bhp** – Brake Horsepower Input to Fan
**Watts** – Input Watts to Motor
*Drive range: 875 to 1192 rpm. All other rpms require field–supplied drive.

**NOTES:**
1. **Boldface** indicates field–supplied drive is required.
2. Maximum continuous bhp is 2.40.
3. See general fan performance notes.

## Table 12 – Fan Performance 48TM-P06 — Vertical Discharge Units; High-Static Motor (Belt Drive)*

| AIRFLOW (Cfm) | EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts |
| **1500** | **802** | **0.42** | **370** | **912** | **0.55** | **489** | **1006** | **0.70** | **624** | **1088** | **0.87** | **773** | **1163** | **1.05** | **935** |
| **1600** | **840** | **0.49** | **432** | **947** | **0.63** | **557** | **1038** | **0.78** | **696** | **1119** | **0.95** | **848** | **1193** | **1.14** | **1013** |
| **1700** | **878** | **0.57** | **502** | **982** | **0.71** | **632** | **1071** | **0.87** | **776** | **1151** | **1.05** | **932** | **1224** | **1.24** | **1100** |
| **1800** | **917** | **0.65** | **581** | **1017** | **0.81** | **716** | **1105** | **0.97** | **864** | **1183** | **1.15** | **1024** | **1255** | **1.35** | **1197** |
| **1900** | **956** | **0.75** | **668** | **1053** | **0.91** | **808** | **1139** | **1.08** | **961** | **1216** | **1.27** | **1126** | **1287** | **1.47** | **1302** |
| **2000** | **995** | **0.86** | **764** | **1090** | **1.02** | **910** | **1173** | **1.20** | **1067** | **1249** | **1.39** | **1236** | 1319 | 1.59 | 1416 |
| **2100** | **1035** | **0.98** | **869** | **1127** | **1.15** | **1021** | **1209** | **1.33** | **1183** | **1283** | **1.53** | **1357** | 1351 | 1.74 | 1541 |
| **2200** | **1075** | **1.11** | **984** | **1164** | **1.29** | **1141** | **1244** | **1.47** | **1309** | 1317 | 1.68 | 1488 | 1385 | 1.89 | 1676 |
| **2300** | **1115** | **1.25** | **1110** | **1202** | **1.43** | **1273** | **1280** | **1.63** | **1446** | 1352 | 1.83 | 1629 | 1418 | 2.05 | 1822 |
| **2400** | **1155** | **1.40** | **1246** | **1240** | **1.59** | **1415** | 1316 | 1.79 | 1594 | 1387 | 2.01 | 1782 | 1452 | 2.23 | 1980 |
| **2500** | **1196** | **1.57** | **1394** | **1278** | **1.77** | **1569** | 1353 | 1.97 | 1753 | 1422 | 2.19 | 1946 | 1486 | 2.42 | 2149 |

| AIRFLOW (Cfm) | EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts |
| **1500** | **1232** | **1.25** | **1109** | **1297** | **1.46** | **1295** | 1357 | 1.68 | 1492 | 1415 | 1.91 | 1700 | 1469 | 2.16 | 1917 |
| **1600** | **1262** | **1.34** | **1190** | 1325 | 1.55 | 1379 | 1385 | 1.78 | 1579 | 1442 | 2.01 | 1788 | 1496 | 2.26 | 2009 |
| **1700** | **1291** | **1.44** | **1281** | 1354 | 1.66 | 1472 | 1414 | 1.89 | 1674 | 1470 | 2.12 | 1887 | 1524 | 2.37 | 2109 |
| **1800** | 1322 | 1.55 | 1380 | 1384 | 1.77 | 1575 | 1443 | 2.00 | 1779 | 1499 | 2.25 | 1994 | 1552 | 2.50 | 2219 |
| **1900** | 1352 | 1.68 | 1489 | 1414 | 1.90 | 1687 | 1472 | 2.13 | 1894 | 1528 | 2.38 | 2112 | 1580 | 2.63 | 2339 |
| **2000** | 1384 | 1.81 | 1607 | 1445 | 2.04 | 1808 | 1502 | 2.27 | 2019 | 1557 | 2.52 | 2240 | 1609 | 2.78 | 2470 |
| **2100** | 1415 | 1.95 | 1736 | 1476 | 2.18 | 1940 | 1533 | 2.43 | 2155 | 1587 | 2.68 | 2378 | — | — | — |
| **2200** | 1448 | 2.11 | 1875 | 1507 | 2.35 | 2083 | 1563 | 2.59 | 2301 | 1617 | 2.85 | 2528 | — | — | — |
| **2300** | 1480 | 2.28 | 2025 | 1539 | 2.52 | 2237 | 1595 | 2.77 | 2459 | — | — | — | — | — | — |
| **2400** | 1513 | 2.46 | 2187 | 1571 | 2.71 | 2403 | — | — | — | — | — | — | — | — | — |
| **2500** | 1547 | 2.66 | 2360 | — | — | — | — | — | — | — | — | — | — | — | — |

LEGEND
**Bhp** – Brake Horsepower Input to Fan
**Watts** – Input Watts to Motor
*Drive range: 1300 to 1685 rpm. All other rpms require field–supplied drive.

**NOTES:**
1. **Boldface** indicates field–supplied drive is required.
2. Maximum continuous bhp is 2.90.
3. See general fan performance notes.

### Table 13 – Fan Performance 48TM-P06 — Single-Phase, Horizontal Discharge Units; Alterante Motor (Belt Drive)*

| AIRFLOW (Cfm) | EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts |
| **1500** | **790** | **0.40** | **353** | 896 | 0.53 | 470 | 990 | 0.67 | 599 | 1074 | 0.83 | 738 | 1151 | 1.00 | 886 |
| **1600** | **828** | **0.46** | **413** | 930 | 0.60 | 535 | 1021 | 0.75 | 669 | 1103 | 0.91 | 812 | 1179 | 1.09 | 965 |
| **1700** | **866** | **0.54** | **479** | 964 | 0.68 | 607 | 1053 | 0.84 | 746 | 1133 | 1.01 | 894 | **1207** | **1.18** | **1051** |
| **1800** | 905 | 0.62 | 553 | 1000 | 0.77 | 687 | 1085 | 0.94 | 831 | 1164 | 1.11 | 984 | **1236** | **1.29** | **1146** |
| **1900** | 944 | 0.71 | 635 | 1036 | 0.87 | 775 | 1119 | 1.04 | 924 | **1195** | **1.22** | **1082** | **1266** | **1.41** | **1248** |
| **2000** | 984 | 0.82 | 725 | 1072 | 0.98 | 871 | 1153 | 1.15 | 1025 | **1227** | **1.34** | **1189** | **1297** | **1.53** | **1360** |
| **2100** | 1024 | 0.93 | 824 | 1109 | 1.10 | 976 | 1188 | 1.28 | 1136 | **1260** | **1.47** | **1305** | **1328** | **1.67** | **1481** |
| **2200** | 1064 | 1.05 | 932 | 1147 | 1.23 | 1090 | **1223** | **1.41** | **1256** | **1294** | **1.61** | **1430** | **1360** | **1.81** | **1612** |
| **2300** | 1105 | 1.18 | 1050 | 1185 | 1.37 | 1215 | **1259** | **1.56** | **1386** | **1328** | **1.76** | **1566** | **1393** | **1.97** | **1752** |
| **2400** | 1146 | 1.33 | 1179 | **1223** | **1.52** | **1349** | **1295** | **1.72** | **1527** | **1362** | **1.93** | **1711** | **1426** | **2.14** | **1903** |
| **2500** | 1187 | 1.48 | 1317 | **1262** | **1.68** | **1494** | **1332** | **1.89** | **1677** | **1398** | **2.10** | **1868** | **1460** | **2.33** | **2065** |

| AIRFLOW (Cfm) | EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts |
| **1500** | **1223** | **1.18** | **1045** | **1291** | **1.36** | **1212** | **1355** | **1.56** | **1388** | **1415** | **1.77** | **1573** | **1473** | **1.99** | **1765** |
| **1600** | **1249** | **1.27** | **1127** | **1316** | **1.46** | **1298** | **1379** | **1.66** | **1478** | **1439** | **1.87** | **1665** | **1496** | **2.09** | **1860** |
| **1700** | **1277** | **1.37** | **1217** | **1342** | **1.57** | **1392** | **1404** | **1.77** | **1575** | **1463** | **1.99** | **1766** | **1520** | **2.21** | **1965** |
| **1800** | **1305** | **1.48** | **1316** | **1369** | **1.68** | **1495** | **1430** | **1.89** | **1681** | **1489** | **2.11** | **1876** | **1545** | **2.34** | **2078** |
| **1900** | **1333** | **1.60** | **1423** | **1397** | **1.81** | **1606** | **1457** | **2.02** | **1797** | **1514** | **2.25** | **1995** | — | — | — |
| **2000** | **1363** | **1.73** | **1540** | **1425** | **1.94** | **1727** | **1484** | **2.16** | **1922** | **1541** | **2.39** | **2124** | — | — | — |
| **2100** | **1393** | **1.87** | **1665** | **1454** | **2.09** | **1857** | **1512** | **2.31** | **2056** | — | — | — | — | — | — |
| **2200** | **1424** | **2.03** | **1801** | **1484** | **2.25** | **1997** | — | — | — | — | — | — | — | — | — |
| **2300** | **1455** | **2.19** | **1946** | — | — | — | — | — | — | — | — | — | — | — | — |
| **2400** | **1487** | **2.37** | **2103** | — | — | — | — | — | — | — | — | — | — | — | — |
| **2500** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

LEGEND
**Bhp** – Brake Horsepower Input to Fan
**Watts** – Input Watts to Motor
*Drive range: 878 to 1192 rpm. All other rpms require field–supplied drive.

**NOTES:**
1. **Boldface** indicates field–supplied drive is required.
2. Maximum continuous bhp is 2.40.
3. See general fan performance notes.

### Table 14 – Fan Performance 48TM-P06 — Horizontal Units; High-Static Motor (Belt Drive)*

| AIRFLOW (Cfm) | EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | | | 0.4 | | | 0.6 | | | 0.8 | | | 1.0 | | |
| | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts |
| **1500** | **790** | **0.40** | **353** | 896 | 0.53 | 470 | 990 | 0.67 | 599 | 1074 | 0.83 | 738 | 1151 | 1.00 | 886 |
| **1600** | **828** | **0.46** | **413** | 930 | 0.60 | 535 | 1021 | 0.75 | 669 | 1103 | 0.91 | 812 | 1179 | 1.09 | 965 |
| **1700** | **866** | **0.54** | **479** | 964 | 0.68 | 607 | 1053 | 0.84 | 746 | 1133 | 1.01 | 894 | 1207 | 1.18 | 1051 |
| **1800** | 905 | 0.62 | 553 | 1000 | 0.77 | 687 | 1085 | 0.94 | 831 | 1164 | 1.11 | 984 | 1236 | 1.29 | 1146 |
| **1900** | 944 | 0.71 | 635 | 1036 | 0.87 | 775 | 1119 | 1.04 | 924 | 1195 | 1.22 | 1082 | — | — | — |
| **2000** | 984 | 0.82 | 725 | 1072 | 0.98 | 871 | 1153 | 1.15 | 1025 | — | — | — | — | — | — |
| **2100** | 1024 | 0.93 | 824 | 1109 | 1.10 | 976 | 1188 | 1.28 | 1136 | — | — | — | — | — | — |
| **2200** | 1064 | 1.05 | 932 | 1147 | 1.23 | 1090 | — | — | — | — | — | — | — | — | — |
| **2300** | 1105 | 1.18 | 1050 | — | — | — | — | — | — | — | — | — | — | — | — |
| **2400** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **2500** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

| AIRFLOW (Cfm) | EXTERNAL STATIC PRESSURE (in. wg) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.2 | | | 1.4 | | | 1.6 | | | 1.8 | | | 2.0 | | |
| | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts | Rpm | Bhp | Watts |
| **1500** | 1223 | 1.18 | 1045 | — | — | — | — | — | — | — | — | — | — | — | — |
| **1600** | 1249 | 1.27 | 1127 | — | — | — | — | — | — | — | — | — | — | — | — |
| **1700** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **1800** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **1900** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **2000** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **2100** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **2200** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **2300** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **2400** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| **2500** | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

LEGEND
**Bhp** – Brake Horsepower Input to Fan
**Watts** – Input Watts to Motor
*Drive range: 1300 to 1685 rpm. All other rpms require field–supplied drive.

**NOTES:**
1. **Boldface** indicates field–supplied drive is required.
2. Maximum continuous bhp is 2.90.
3. See general fan performance notes.

# PRE-START-UP

**⚠ WARNING**

**ELECTRICAL OPERATION HAZARD**

Failure to observe the following warnings could result in personal injury and/or death:

1. Follow recognized safety practices and wear prtective goggles when checking or servicing refrigerant system.
2. Do not operate compressor or provide any electric power to unit unless compressor terminal cover is in place and secured.
3. Do not remove compressor terminal cover until all electrical sources are disconnected.
4. Relieve all pressure from system before touching or disturbing anything inside compressor terminal box if refrigerant leak is suspected around compressor terminals.
5. Never attempt to repair soldered connection while refrigerant system is under pressure.
6. Do not use torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear protective goggles and proceed as follows:
   a. Shut off gas and then electrical power to unit. Install lockout tag.
   b. Relieve all pressure from system using both high and low-pressure ports. Recover refrigerant.
   c. Cut component connection tubing with tubing cutter and remove component from unit.
   d. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

Proceed as follows to inspect and prepare the unit for initial start-up:

1. Remove all access panels.
2. Read and follow instructions on all WARNING, CAUTION, and INFORMATION labels attached to or shipped with, the unit.
3. Make the following inspections:
   a. Inspect for shipping and handling damages such as broken lines, loose parts, or disconnected wires, etc.
   b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector, halide torch, or liquid-soap solution.
   c. Inspect all field-and factory-wiring connections. Be sure that connections are completed and tight.
   d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
4. Verify the following conditions:
   a. Make sure that condenser fan blade is correctly positioned in fan orifice. Refer to Condenser-Fan Adjustment section for more details.
   b. Make sure that air filter(s) is in place.
   c. Make sure that condensate drain trap is filled with water to ensure proper drainage.
   d. Make sure that all tools and miscellaneous loose parts have been removed.

# START-UP

## Unit Preparation

Make sure that unit has been installed in accordance with these installation instructions and applicable codes.

## Return-Air Filters

Make sure correct filters are installed in unit. (See Table 1.) Do not operate unit without return-air filters.

## Compressor Mounting

Compressors are internally spring mounted. Do not loosen or remove compressor holddown bolts.

## Internal Wiring

Check all electrical connections in unit control boxes; tighten as required. Ensure wiring does not come in contact with sharp metal edges.

## Gas Piping

Check gas piping for leaks.

**⚠ WARNING**

**FIRE, EXPLOSION HAZARD**

Failure to follow this warning could result in personal injury or death.

Disconnect gas piping from unit when leak testing at pressure greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it must be replaced before use. When pressure testing field-supplied gas piping at pressures of 0.5 psig or less, a unit connected to such piping must be isolated by closing the manual gas valve.

## Refrigerant Service Ports

To service refrigerant service ports, remove access panel. Each unit system has 2 Schrader-type service ports: one on the suction line and one on the compressor discharge line. Be sure that caps on the ports are tight.

## Compressor Rotation

It is important to be certain compressor is rotating in the proper direction. To determine whether or not compressor is rotating in the proper direction:

1. Connect service gauges to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up.

If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

1. Note that the evaporator fan is probably also rotating in the wrong direction.
2. Turn off power to the unit.
3. Reverse any two of the unit power leads.
4. Reapply power to the compressor.

The suction and discharge pressure levels should now move to their normal start-up levels.

**NOTE**: When the compressor is rotating in the wrong direction, the unit makes an elevated level of noise and does not provide cooling.

## Cooling

Set space thermostat to OFF position. To start unit, turn on main power supply. Set system selector switch at COOL position and fan switch at AUTO position. Adjust thermostat to a setting below room temperature. Compressor starts on closure of contactor.

Check unit charge. Refer to Refrigerant Charge section.

Reset thermostat at a position above room temperature. Compressor will shut off. Evaporator fan will shuot off after 30-second delay.

### To Shut Off Unit

Set system selector switch at OFF position. Resetting thermostat at a position above room temperature shuts unit off temporarily until space temperature exceeds thermostat setting.

## Main Burners

Main burners are factory set and should require no adjustment.

TO CHECK ignition of main burners and heating controls, move thermostat set point above room temperature and verify that the burners light and evaporator fan is energized. After ensuring that the unit continues to heat the building, lower the thermostat setting below room temperature and verify that the burners and evaporator fan turn off. (Fan will turn off only if fan selector switch is in the AUTO. position.)

Refer to Table 15 and 16 for the correct orifice to use at high altitudes.

**Table 15 – Altitude Compensation* Standard and No NOx Units**

| ELEVATION (ft) | 72,000, 74,000 AND 115,000 BTUH NOMINAL INPUT | | 150,000 BTUH NOMINAL INPUT | |
|---|---|---|---|---|
| | Natural Gas Orifice Size† | Liquid Propane Orifice Size† | Natural Gas Orifice Size† | Liquid Propane Orifice Size† |
| 0–2,000 | 33 | 43 | 30 | 37 |
| 2,000 | 36 | 44 | 31 | 39 |
| 3,000 | 36 | 45 | 31 | 40 |
| 4,000 | 37 | 45 | 32 | 41 |
| 5,000 | 38 | 46 | 32 | 42 |
| 6,000 | 40 | 47 | 34 | 43 |
| 7,000 | 41 | 48 | 35 | 43 |
| 8,000 | 42 | 49 | 36 | 44 |
| 9,000 | 43 | 50 | 37 | 45 |
| 10,000 | 44 | 50 | 39 | 46 |
| 11,000 | 45 | 51 | 41 | 47 |
| 12,000 | 46 | 52 | 42 | 48 |
| 13,000 | 47 | 52 | 43 | 49 |
| 14,000 | 48 | 53 | 44 | 50 |

*As the height above sea level increases, there is less oxygen per cubic foot of air. Therefore, heat input rate should be reduced at higher altitudes.

† Orifices available through your Carrier distributor.

## Heating

1. Purge gas supply line of air by opening union ahead of gas valve. If gas odor is detected, tighten union and wait 5 minutes before proceeding.
2. Turn on electrical supply and manual gas valve.
3. Set system switch selector at HEAT position and fan switch at AUTO. or ON position. Set heating temperature lever above room temperature.
4. The induced-draft motor will start.

**Table 16 – Altitude Compensation* Low NOx Units**

| ELEVATION (ft) | 60,000 AND 90,000 BTUH NOMINAL INPUT | | 120,000 BTUH NOMINAL INPUT | |
|---|---|---|---|---|
| | Natural Gas Orifice Size† | Liquid Propane Orifice Size† | Natural Gas Orifice Size | Liquid Propane Orifice Size† |
| 0–2,000 | 38 | 45 | 32 | 42 |
| 2,000 | 40 | 47 | 33 | 43 |
| 3,000 | 41 | 48 | 35 | 43 |
| 4,000 | 42 | 49 | 36 | 44 |
| 5,000 | 43 | 49 | 37 | 45 |
| 6,000 | 43 | 50 | 38 | 45 |
| 7,000 | 44 | 50 | 39 | 46 |
| 8,000 | 45 | 51 | 41 | 47 |
| 9,000 | 46 | 52 | 42 | 48 |
| 10,000 | 47 | 52 | 43 | 49 |
| 11,000 | 48 | 53 | 44 | 50 |
| 12,000 | 49 | 53 | 44 | 51 |
| 13,000 | 50 | 54 | 46 | 52 |
| 14,000 | 51 | 54 | 47 | 52 |

5. After a call for heating, the main burners should light within 5 seconds. If the burner does not light, then there is a 22-second delay before another 5-second try. If the burner still does not light, the time delay is repeated. If the burner does not light within 15 minutes, there is a lockout. To reset the control, break the 24-v power to W1.
6. The evaporator-fan motor will turn on 45 seconds after the burners are ignited.
7. The evaporator-fan motor will turn off 45 seconds after thermostat temperature is satisfied.
8. Adjust airflow to obtain a temperature rise within the range specified on the unit nameplate.

**NOTE**: The default value for the evaporator-fan motor ON/ OFF delay is 45 seconds. The Integrated Gas Unit Controller (IGC) modifies this value when abnormal limit switch cycles occur. Based upon unit operating conditions, the ON delay can be reduced to 0 seconds and the OFF delay can be extended to 180 seconds. When one flash of the LED is observed, the evaporator-fan ON/OFF delay has been modified.

If the limit switch trips at the start of the heating cycle during the evaporator ON delay, the time period of the ON delay for the next cycle will be 5 seconds less than the time at which the switch tripped. (Example: If the limit switch trips at 30 seconds, the evaporator-fan ON delay for the next cycle will occur at 25 seconds.) To prevent short-cycling, a 5-second reduction will only occur if a minimum of 10 minutes has elapsed since the last call for heating.

The evaporator-fan OFF delay can also be modified. Once the call for heating has ended, there is a 10-minute period during which the modification can occur. If the limit switch trips during this period, the evaporator-fan OFF delay will increase by 15 seconds. A maximum of 9 trips can occur, extending the evaporator-fan OFF delay to 180 seconds.

To restore the original default value, reset the power to the unit.

### To Shut Off Unit

Set system selector switch at OFF position. Resetting heating selector lever below room temperature will temporarily shut unit off until space temperature falls below thermostat setting.

## Safety Relief

A soft solder joint in the suction line at the low-pressure service port provides pressure relief under abnormal temperature and pressure conditions (e.g., fire in building).

## Ventilation (Continuous Fan)

Set fan and system selector switches at ON and OFF positions, respectively. Evaporator fan operates continuously to provide constant air circulation. When the evaporator-fan selector switch is turned to the OFF position, there is a 30-second delay before the fan turns off.

## Operating Sequence

### Cooling, Units Without Economizer

When thermostat calls for cooling, terminals G and Y1 are energized. The indoor-fan contactor (IFC) and compressor contactor are energized and indoor-fan motor, compressor, and outdoor fan starts. The outdoor-fan motor runs continuously while unit is cooling.

### Heating, Units Without Economizer

When the thermostat calls for heating, terminal W1 is energized. To prevent thermostat short-cycling, the unit is locked into the Heating mode for at least 1 minute whenW1 is energized. The induced-draft motor is energized and the burner ignition sequence begins. The indoor (evaporator) fan motor (IFM) is energized 45 seconds after a flame is ignited. On units equipped for two stages of heat, when additional heat is needed, W2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the thermostat is satisfied and W1 is deenergized, the IFM stops after a 45-second timeoff delay.

### Cooling, Units With EconoMi$er IV

When free cooling is not available, the compressors will be controlled by the zone thermostat. When free cooling is available, the outdoor-air damper is modulated by the EconoMi$er IV control to provide a 50° to 55°F supply-air temperature into the zone. As the supply-air temperature fluctuates above 55° or below 50°F, the dampers will be modulated (open or close) to bring the supply-air temperature back within the set point limits.

Integrated EconoMi$er IV operation on single-stage units requires a 2-stage thermostat (Y1 and Y2).

For EconoMi$er IV operation, there must be a thermostat call for the fan (G). This will move the damper to its minimum position during the occupied mode.

If the increase in cooling capacity causes the supply-air temperature to drop below 45°F, then the outdoor-air damper position will be fully closed. If the supply-air temperature continues to fall, the outdoor-air damper will close. Control returns to normal once the supply-air temperature rises above 48°F.

If optional power exhaust is installed, as the outdoor-air damper opens and closes, the power exhaust fans will be energized and deenergized.

If field-installed accessory $CO_2$ sensors are connected to the EconoMi$er IV control, a demand controlled ventilation strategy will begin to operate. As the $CO_2$ level in the zone increases above the $CO_2$ set point, the minimum position of the damper will be increased proportionally. As the $CO_2$ level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed. Damper position will follow the higher demand condition from DCV mode or free cooling mode.

Damper movement from full closed to full open (or vice versa) will take between 1-1/2 and 2-1/2 minutes.

If free cooling can be used as determined from the appropriate changeover command (switch, dry bulb, enthalpy curve, differential dry bulb, or differential enthalpy), a call for cooling (Y1 closes at the thermostat) will cause the control to modulate the dampers open to maintain the supply air temperature set point at 50° to 55°F.

As the supply-air temperature drops below the set point range of 50° to 55°F, the control will modulate the outdoor-air dampers closed to maintain the proper supply-air temperature.

### Heating, Units With EconoMi$er IV

When the room temperature calls for heat, the heating controls are energized as described in the Heating, Units Without Economizer section. When the thermostat is satisfied, the economizer damper moves to the minimum position.

### Cooling, Units With EconoMi$er2, PremierLink™ Control and a Thermostat

When free cooling is not available, the compressors will be controlled by the PremierLink control in response to the Y1 and Y2 inputs from the thermostat.

The PremierLink control will use the following information to determine if free cooling is available:

- Indoor fan has been on for at least 30 seconds.
- The SPT, SAT, and OAT inputs must have valid readings.
- OAT must be less than 75°F.
- OAT must be less than SPT.
- Enthalpy must be LOW (may be jumpered if an enthalpy sensor not available).
- Economizer position is NOT forced.

Pre-cooling occurs when there is no call from the thermostat except G. Pre-cooling is defined as the economizer modulates to provide 70°F supply air.

When free cooling is available the PremierLink control will control the compressors and economizer to provide a supply air temperature determined to meet the Y1 and Y2 calls from the thermostat using the following three routines. The three control routines are based on OAT.

The 3 routines are based on OAT where:

SASP = Supply Air Set Point
DXCTLO = Direct Expansion Cooling Lockout Set Point
PID = Proportional Integral

**Routine 1 (OAT < DXCTLO)**

- Y1 energized - economizer maintains a SASP = (SATLO1 + 3).
- Y2 energized - economizer maintains a SASP = (SATLO2 + 3).

**Routine 2 (DXCTLO < OAT < 68°F)**

- If only Y1 energized, the economizer maintains a SASP = (SATLO1 + 3).
- If SAT > SASP + 5 and economizer position > 80%, economizer will go to minimum position for 3 minutes or until SAT > 68°F.
- First stage of mechanical cooling will be energized.
- Integrator resets.
- Economizer opens again and controls to current SASP after stage one on for 90 seconds.
- With Y1 and Y2 energized Economizer maintains an SASP = SATLO2 + 3.
- If SAT > SASP + 5 and economizer position >80%, economizer will go to minimum position for 3 minutes or until SAT > 68°F.
- If compressor one is on then second stage of mechanical cooling will be energized. Otherwise the first stage will be energized.
- Integrator resets.
- Economizer opens again and controls to SASP after stage one on for 90 seconds.

**Routine 3 (OAT > 68)**

- Economizer is opened 100%.
- Compressors 1 and 2 are cycled based on Y1 and Y2 using minimum on and off times and watching the supply air temperature as compared to SATLO1 and SATLO2 set points.

If optional power exhaust is installed, as the outdoor-air damper opens and closes, the power exhaust fans will be energized and deenergized.

If field-installed accessory $CO_2$ sensors are connected to the PremierLink™ control, a PID-controlled demand ventilation strategy will begin to operate. As the $CO_2$ level in the zone increases above the $CO_2$ set point, the minimum position of the damper will be increased proportionally. As the $CO_2$ level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed.



## Heating, Units With EconoMi$er2, PremierLink™ Control and a Thermostat

When the thermostat calls for heating, terminal W1 is energized. The PremierLink control will move the economizer damper to the minimum position if there is a call for G and closed if there is a call for W1 without G. In order to prevent thermostat from short cycling, the unit is locked into the heating mode for at least 10 minutes when W1 is energized. The induced-draft motor is then energized and the burner ignition sequence begins.

On units equipped for two stages of heat, when additional heat is needed, W2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the thermostat is satisfied and W1 is deenergized, the IFM stops after a 45-second time-off delay unless G is still maintained.

## Cooling, Units With EconoMi$er2, PremierLink Control and a Room Sensor

When free cooling is not available, the compressors will be controlled by the PremierLink controller using a PID Error reduction calculation as indicated by Fig 44.

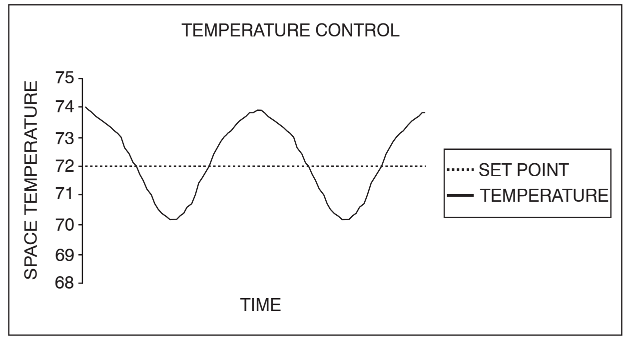
The PremierLink controller will use the following information to determine if free cooling is available:

- Indoor fan has been on for at least 30 seconds.
- The SPT, SAT, and OAT inputs must have valid readings.
- OAT must be less than 75°F.
- OAT must be less than SPT.
- Enthalpy must be LOW (may be jumpered if and enthalpy sensor is not available).
- Economizer position is NOT forced.

When free cooling is available, the outdoor-air damper is positioned through the use of a Proportional Integral (PID) control process to provide a calculated supply-air temperature into the zone. The supply air will maintain the space temperature between the heating and cooling set points as indicated in Fig. 45.

The PremierLink control will integrate the compressors stages with the economizer based on similar logic as the three routines listed in the previous section. The SASP will float up and down based on the error reduction calculations that compare space temperature and space set point.

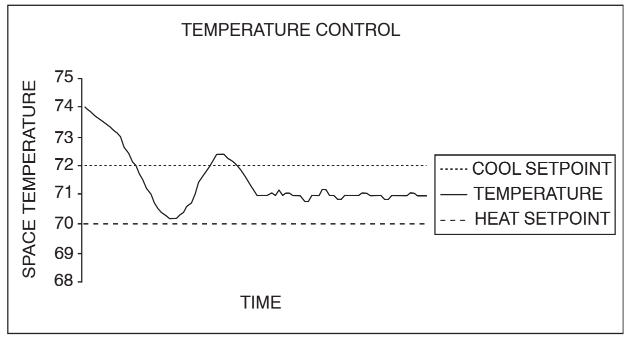
When outside-air temperature conditions require the economizer to close for a compressor stage-up sequence, the economizer control integrator is reset to zero after the stage-up sequence is completed. This prevents the supply-air temperature from dropping too quickly and creating a freeze condition that would make the compressor turn off prematurely.




NOTE: PremierLink control performs smart staging of 2 stages of DX cooling and up to 3 stages of heat.

C06042

**Fig. 44 - DX Cooling Temperature Control Example**




C06043

**Fig. 45 - Economizer Temperature Control Example**

The high space set point is used for DX (direct expansion) cooling control, while the economizer space set point is a calculated value between the heating and cooling set points. The economizer set point will always be at least one degree below the cooling set point, allowing for a smooth transition from mechanical cooling with economizer assist, back to economizer cooling as the cooling set point is achieved. The compressors may be used for initial cooling then the PremierLink controller will modulate the economizer using an error reduction calculation to hold the space temperature between the heating and cooling set points. (See Fig. 45.)

The controller uses the following conditions to determine economizer cooling:

- Enthalpy is Low
- SAT reading is available
- OAT reading is available
- SPT reading is available
- OAT≤SPT
- Economizer Position is NOT forced

If any of the above conditions are not met, the economizer submaster reference (ECSR) is set to maximum limit and the damper moves to minimum position. The operating sequence is complete. The ECSR is recalculated every 30 seconds.

If an optional power exhaust is installed, as the outdoor-air damper opens and closes, the power exhaust fans will be energized and deenergized.

If field-installed accessory $CO_2$ sensors are connected to the PremierLink™ control, a PID-controlled demand ventilation strategy will begin to operate. As the $CO_2$ level in the zone increases above the $CO_2$ set point, the minimum position of the damper will be increased proportionally. As the $CO_2$ level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed.

## Heating, Units With EconoMi$er2, PremierLink™ Control and a Room Sensor

Every 40 seconds the controller will calculate the required heat stages (maximum of 3) to maintain supply-air temperature (SAT) if the following qualifying conditions are met:

- Indoor fan has been on for at least 30 seconds.
- COOL mode is not active.
- OCCUPIED, TEMP.COMPENSATED START or HEAT mode is active.
- SAT reading is available.
- Fire shutdown mode is not active.

If all of the above conditions are met, the number of heat stages is calculated; otherwise the required number of heat stages will be set to 0.

If the PremierLink controller determines that heat stages are required, the economizer damper will be moved to minimum position if occupied and closed if unoccupied.

Staging should be as follows:

**If Heating PID STAGES=2**

- HEAT STAGES=1 (50% capacity) will energize HS1
- HEAT STAGES=2 (100% capacity) will energize HS2

**If Heating PID STAGES=3 and AUXOUT = HS3**

- HEAT STAGES=1 (33% capacity) will energize HS1
- HEAT STAGES=2 (66% capacity) will energize HS2
- HEAT STAGES=3 (100% capacity) will energize HS3

In order to prevent short cycling, the unit is locked into the Heating mode for at least 10 minutes when HS1 is deenergized. When HS1 is energized the induced-draft motor is then energized and the burner ignition sequence begins. On units equipped for two stages of heat, when additional heat is needed, HS2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the space condition is satisfied and HS1 is deenergized the IFM stops after a 45-second time-off delay unless in the occupied mode. The fan will run continuously in the occupied mode as required by national energy and fresh air standards.

# SERVICE TRAINING

**Packaged Service Training** programs are an excellent way to increase your knowledge of the equipment discussed in this manual, including:

- Unit Familiarization
- Maintenance
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- Operating Sequence

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# START-UP CHECKLIST

**(Remove and Store in Job File)**

## I. PRELIMINARY INFORMATION:

MODEL NO.:______________________ SERIAL NO.:______________________

DATE:______________________ TECHNICIAN:______________________

BUILDING LOCATION: ______________________

## II. PRE-START-UP (Insert checkmark in box as each item is completed):

- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED AS SHOWN IN THE INSTALLATION INSTRUCTIONS
- ☐ CHECK ALL ELECTRICAL CONNECTIONS AND TERMINALS FOR TIGHTNESS
- ☐ CHECK THAT RETURN-AIR FILTERS ARE CLEAN AND IN PLACE
- ☐ CHECK THAT OUTDOOR AIR INLET SCREENS ARE IN PLACE
- ☐ VERIFY THAT UNIT INSTALLATION IS LEVEL WITHIN TOLERANCES LISTED IN THE INSTALLATION INSTRUCTIONS
- ☐ CHECK FAN WHEEL AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE, AND SETSCREW TIGHTNESS
- ☐ CHECK PULLEY ALIGNMENT AND BELT TENSION
- ☐ CHECK TO ENSURE THAT ELECTRICAL WIRING IS NOT IN CONTACT WITH REFRIGERANT LINES OR SHARPMETAL EDGES.

## II. START-UP

### ELECTRICAL

| | | | | | | |
|---|---|---|---|---|---|---|
| SUPPLY VOLTAGE | L1-L2 | ______ | L2-L3 | ______ | L3-L1 | ______ |
| COMPRESSOR AMPS | L1 | ______ | L2 | ______ | L3 | ______ |
| INDOOR FAN AMPS | L1 | ______ | L2 | ______ | L3 | ______ |

### TEMPERATURES

| | | | | |
|---|---|---|---|---|
| OUTDOOR-AIR TEMPERATURE | ______ | DB | | |
| RETURN-AIR TEMPERATURE | ______ | DB | ______ | WB |
| COOLING SUPPLY AIR | ______ | DB | ______ | WB |

### REFRIGERANT

| | | | | |
|---|---|---|---|---|
| REFRIGERANT SUCTION | ______ | PSIG | ______ | F |
| REFRIGERANT DISCHARGE | ______ | PSIG | ______ | F |

### GENERAL

- ☐ VERIFY 3-PHASE SCROLL COMPRESSOR IS ROTATING IN THE CORRECT DIRECTION
- ☐ VERIFY FAN MOTOR IS ROTATING IN THE CORRECT DIRECTION. IF NOT, RETIGHTEN MOTOR PULLEY AND PROVIDE CORRECT ELECTRICAL PHASING TO UNIT.

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